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CONTENTS

	PAGE
Editorials	633
Letters to the Editor	637
Publications Received	637
The Scrap Heap	638
Overseas Railway Affairs	639
Balancing of Locomotives Reciprocating Parts	641
Can Hammer-Blow be Abolished?	645
The Junction Interlocking Problem	650
Road Transport Section	655
Pictorial Retrospect of 1941	661
Railway News Section	671
Personal	671
Transport Services and the War	673
Stock Market and Table	680

GOODS FOR EXPORT

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export

DISPATCH OF "THE RAILWAY GAZETTE"
OVERSEAS

We would remind our readers that there are many overseas countries to which it is not permissible for private individuals to send printed journals and newspapers. THE RAILWAY GAZETTE possesses the necessary permit and machinery for such dispatch, and any reader desirous of arranging for copies to be delivered to an agent or correspondent overseas should place the order with us together with the necessary delivery instructions.

We would emphasise that copies addressed to places in Great Britain should not be re-directed to places overseas, as they are stopped under the provisions of Statutory Rules & Orders No. 1190 of 1940, and No. 359 of 1941

ANSWERS TO ENQUIRIES

By reason of staff shortage due to enlistment, we regret that it is no longer possible for us to answer enquiries involving research, or to supply dates when articles appeared in back numbers, either by telephone or by letter

TO CALLERS AND TELEPHONERS

Until further notice our office hours are:
 Mondays to Fridays 9.30 a.m. till 3.45 p.m.
 The office is closed on Saturdays

The Third Wartime Christmas

THE third Christmas of the war comes at a time when the conflict has recently spread to the four quarters of the globe and when major calls on both the personnel and the productive capacity of this country are being made. How great a part in the struggle is being played by railways all over the world has been recorded in the columns of THE RAILWAY GAZETTE ever since the war began. The demands now being made upon British productive industry will increase the strain on all forms of transport and the ancillary industries, nor is there any doubt that still further efforts will be necessary; but, given wisdom in planning, the great railway systems will shoulder their burden. In war the primary importance of railways as a vital means of transport for vast masses of men and materials is made apparent as it can never be in peace, and the success or failure of each and every one of the belligerents is inextricably interwoven with the ability to maintain high efficiency of the transport system involved. Many of the usual Christmas festivities, more especially those which call for transport, will be absent this year, but, if the season is marked too by a greater consciousness of national strength and determination. The difficulties which lie ahead are grave, but there is surer ground for sober confidence, provided it is backed by maximum effort, than ever before.

Railway Stockholders and War Damage

The continued uncertainty which is felt by railway stockholders as to the effect of railway liability for war damage was dealt with at some length by Sir Charles Stuart-Williams at the annual general meeting of the British Railway Stockholders' Union. The imponderables in this connection are obviously large, and at this stage of the war it is impossible to reduce them even to an approximate figure. Moreover, so far as war damage has been sustained already, knowledge of the original cost of destroyed assets, even if it could be made known without assisting the enemy, would not provide a basis for estimating the cost of replacing them during a period in which costs which have shown, and may continue to show, substantial advances. The whole matter of air raid damage so far as it affects railway companies is both difficult and complicated, but there will be many who would share Sir Charles's hope that the Government may soon be able to indicate its exact intentions as to the class of public utilities in which railways are now to be included for purposes of war damage.

Rehabilitation of Mexican Railways

In recent weeks details have appeared in THE RAILWAY GAZETTE of substantial purchases by the National Railways of Mexico of rolling stock in the United States. The President of Mexico, Señor Avila Camacho, in a report to the House of Representatives, recently stated that the rehabilitation of the National Railways was divided into three phases, namely physical, financial, and labour. The physical aspect involved the laying of 112-lb. rails on 1,800 miles of trunk lines, the reconstruction of tracks, the enlargement of yards and sidings, and the reconditioning of equipment. The Tehuantepec National Railway line from Salina Cruz to Coatzacoalco was being reconstructed. Although financial conditions had improved, the situation was not entirely satisfactory because the physical property alone required an investment of 200,000,000 pesos (about £8,000,000). Certain arrangements had been established to eliminate the deficit on the railways. A Committee of Reorganisation comprising the President, the Secretaries of Finance and of the Department of Communications, the General Manager of the rail-

XMAS PUBLISHING ARRANGEMENTS

To conserve paper and reduce postage of copies in Christmas week, this and next week's issues of THE RAILWAY GAZETTE have been combined. There will thus be a fortnight's interval until the next regular weekly issue, due to be published on Friday, January 2

ways, and the General Secretary of the Union of Railroad Workers was attempting to attain a more effective solution of the problems facing the railway industry.

Overseas Railway Traffics

Owing to the near approach of the Christmas holidays we are unable to give the usual fortnightly results of overseas railways. The striking feature in the traffics of the British-owned Argentine railway companies for the 23rd week of the financial year is the gain of 643,000 pesos on the Buenos Ayres Great Southern which brings the aggregate increase to nearly 6,000,000 pesos. Otherwise, except on the Central Argentine, which has an increase of 183,200 pesos against 80,150, and on the Argentine North Eastern, which has an increase of 50,300 pesos, against 37,700, the gains for the 23rd week are less than those for the previous week. The Leopoldina records an increase of £159,489 for the 49 weeks of 1941.

	No. of weekly traffic	Inc. or decrease	Aggregate traffic	Inc. or decrease
Buenos Ayres & Pacific*	23rd 1,380	+ 52	29,795	+ 3,525
Buenos Ayres Great Southern*	23rd 2,763	+ 643	49,917	+ 5,745
Buenos Ayres Western*	23rd 855	+ 49	19,093	+ 3,811
Central Argentine* ...	23rd 1,534	+ 183	41,117	+ 9,194
Canadian Pacific	49th 932,600	+ 201,000	40,981,000	+ 9,323,600
Bombay, Baroda & Central India ...	34th 331,350	+ 19,500	7,046,775	+ 534,375

* Traffic returns in thousands of pesos.

*On the Central Uruguay the aggregate increase for the 23 weeks of the financial year is £56,864 in sterling and \$437,683 in currency.

Locomotive Balancing

Two papers of outstanding interest and importance were presented last Tuesday to a joint meeting of the Institutions of Civil and Mechanical Engineers. One, stating a case for the complete abolition of reciprocating balance in locomotives, was by Sir Harold N. Colam, formerly Chief Engineer and lately General Manager of the Madras & Southern Mahratta Railway, and Major J. D. Watson, the Bridge Engineer of that line. The paper was frankly brief, and adduced arguments and quoted evidence, based upon many practical experiments, for the complete elimination of hammer-blow. The second paper, by Mr. E. S. Cox, Chief Technical Assistant to the Chief Mechanical Engineer, L.M.S.R., was a reasoned review of the whole subject of locomotive balancing in this country, and besides a statement of theoretical considerations, recorded the results of experience, particularly on the L.M.S.R. Mr. Cox's suggestion, however, that, whereas the Bridge Stress Committee in its report published in 1928, very thoroughly covered the subject of locomotive balancing in respect of the vertical forces, no comparable investigation had been made into the effect of the horizontal forces on the locomotive itself, must be qualified by the very fact of the other paper presented at the same meeting. In view of the tendency during recent years towards higher speeds, this subject of locomotive balancing and its effects, both on the permanent way, including bridges, and on the locomotive itself, assumes an importance which well deserves the treatment it has received in the two papers summarised at pages 641 to 647. We hope to revert to the discussion on the papers in a later issue.

A Notable Swiss Arch

Dimensions recently published show the magnificent ferro-concrete arch recently completed by the Swiss Federal Railways across the River Aar at Berne, illustrated on p. 667, to be one of the largest arches of its kind in the world. The clear span is 490 ft.; the rise of the arch 110 ft., and to accommodate the four railway tracks of the Wilerfeld deviation (described in our issue of November 7) the width of the bridge is 43 ft. 9 in. The thickness of the arch itself tapers from 16 ft. 6 in. at the springing to 10 ft. 6 in. at the crown; the centring used in its construction required 1,530 cu. yd. of timber. In the entire bridge, which is 1,080 ft. long, a total of 38,450 cu. yd. of concrete and 1,795 tons of steel reinforcement were incorporated. This

structure leaves in the shade several previous bridges of note in Switzerland. One of these, the Langwies bridge on the Chur—Arosa line, is also of reinforced concrete construction, and with a span of 315 ft., is particularly notable for the slenderness of its construction, the railway concerned being little more than an electric tramway carrying light loads. Travellers to and from the Engadine are also familiar with the remarkable masonry viaducts of the metre-gauge Rhaetian main lines, and in particular with Wiesen bridge across the Landwasser gorge, on the Davos to Filisur section, which carries the rails 300 ft. above the river by a masonry arch of 180 ft. span.

The Brooklyn-Battery Road Tunnel

On October 28, 1940, President Roosevelt broke the ground for the Brooklyn—Battery road tunnel, which will consist of two dual lane tubes, each 10,000 ft. long, to link the circumferential highway system of Manhattan with the Belt Parkway in Brooklyn. The work is estimated to require 6,000,000 man hours of labour over a period of 4 years, as this will be one of the largest and most difficult engineering jobs of its kind ever undertaken in New York City. The tunnel is being built, under contracts, by the New York City Tunnel Authority, at a cost which it is thought will reach \$57,000,000. The finished work will have an annual capacity of 16,000,000 vehicles. The tunnel will consist of two cast-iron tubes, of 31 ft. dia., lined with concrete. The roadways will be 21 ft. in width and accommodate two lanes of traffic. Fresh air ducts will be under the roadways, and exhaust ducts above. In general, the design of the tubes is practically identical with that of the Holland, Lincoln, and Queens-Midtown tunnels. Except for about 1,000 ft. at the Manhattan end and 4,000 ft. at the Brooklyn end, all of the subaqueous part of the tunnel—some 5,000 ft. in each tunnel—will be through rock. So far the only rock work undertaken has been the sinking of the 82 ft. Manhattan construction shaft.

U.S.A. Road-Rail Co-ordinated Services

The Gulf, Mobile & Northern Railroad was a pioneer in the use of road-rail co-ordinated services, both passenger and freight, and, since its consolidation last year with the Mobile & Ohio Railroad, the new company—the Gulf, Mobile & Ohio Railroad—has gone ahead in its aim of paralleling its rail lines with road routes in the interest of improved service. The railway has two transport subsidiaries, the Gulf Transport Company and the Mobile & Ohio Transportation Company, which operate 86 vehicles over 1,700 route miles daily. The importance of feeder routes between towns where there is no railway service has been demonstrated by these co-ordinated operations. Lorries running on three of these feeder services during 1940 handled 109,091,157 lb. of goods, on practically all of which the railway also received the revenue for a long haul in freight service. A feeder route between Houston, Miss., and Calhoun City, 21 miles long, was begun in October, 1939, at the request of the local authorities after the Okolona, Houston & Calhoun City Railroad was forced to abandon operations because of financial difficulties. In the next year, 45,972,272 lb. of freight was handled on this route.

History of Slip-Coach Working

At a meeting in London of the Railway Club on October 11, Canon R. B. Fellows read a paper on the history of slip-coach working. When the London & Blackwall Railway was opened in 1840, the various intermediate stations were served by slipping or dropping a carriage at each station, and in 1843 the Hayle Railway slipped passenger carriages from mixed trains. Slip carriages as now understood were, however, first run in 1858 when in February of that year the L.B. & S.C.R. slipped carriages for Lewes and Hastings from a Brighton train at Haywards Heath. The slip carriage was attached to the main portion of the train by means of a special coupling, and special regulations were issued controlling the working. The public timetables

did not, however, indicate that the service was by means of slip carriages. In May, 1858, the South Eastern Railway slipped carriages for Ashford and Ramsgate at Canterbury; a note in the timetables against the train concerned read "Carriages detached at Canterbury for Ashford and Ramsgate." In December, 1858, the G.W.R. began to slip at Banbury, the timetable for that month stating "Carriage detached at Banbury," although in the preceding month the same company had been experimenting with slip carriages at Slough. Canon Fellows gave details of various methods employed in connection with the slipping of carriages at various dates, and pointed out the several disadvantages of slip carriages. There was no really safe method of working, and mishaps occurred from time to time. We referred to slip-coach services at some length in our October 11, 1935, issue (page 577); and tabulated developments over a long period of years in our January 10, 1936, issue (page 74). The operation of slip carriages was discontinued in September, 1939.

Circuit Interlocking Progress in America

The pages of our American contemporary *Railway Signaling* continue to bear witness to the remarkable progress achieved by circuit interlocking in its various forms, by which we mean, for the purpose of this note, the various arrangements, whether involving some form of C.T.C. remote working or not, in which interlocking in its old established types is not seen at all, but is replaced by circuit combinations and apparatus operated by the signalman—when he can be called such—of the button and switch type. The amount of thought bestowed on this class of equipment has been quite remarkable and new installations are constantly coming into service. Sometimes, it is true, they are of no great size, but some of the most ingenious arrangements of interlocking circuits can be found in connection with quite small layouts, where peculiar operating conditions call for special treatment. The increasing popularity of C.T.C. methods is effecting almost a revolution in the conception of single line working in some areas, and bringing the signalman, albeit with a widely extended field of activity, into a picture from which he was at first absent, and where the adoption of purely automatic signalling at one time made it seem improbable he would ever appear.

Two Cylinders or Three

Opinion has always been divided concerning the relative merits of two, three, and four cylinder locomotives. The two cylinder locomotive has its share of advantages, principal among them being its greater simplicity, which naturally is, or should be, reflected in the costs of maintenance. A disadvantage, however, is the tendency of large and powerful engines with two outside cylinders to shoulder in running, the alternate thrusts of large pistons on each side being responsible for this action. In modern design this is, however, not so pronounced as in former times and, in any case, the majority of high-power express locomotives in this country are nowadays of the three and four cylinder types. The additional cylinders, with their reduced impulses and superior balancing of driving forces, and consequently lessened stresses, require lighter individual parts. Nevertheless, experienced locomotive drivers have been known to voice a preference for the two over the three cylinder engine. In one case a driver, who had had many years on the footplate with different types and classes of locomotives, said of a certain class of three cylinder engine that it would not work suitably or be so capable when notched up as a similar and older two cylinder class, and that it made a bad show working up banks notched up anywhere above 40 per cent. cut-off. He expressed a strong preference for the two cylinder engine, in defiance of the theoretical claims for the superiority of the three cylinder engine. Statements of this kind, whilst being entitled to respect as coming from men who handle the engines, are usually based on experience with particular classes of engine and are consequently to be discounted if used as a general argument against multi-cylinder engines.

Routing and Gauging of Australian Railways

WITH recent developments in the East the question of the location and gauge of the Australian railways has assumed a new importance. Some years have passed since the Railway Commissioners considered the possibility of a conversion of all the Australian railways to the standard gauge (4 ft. 8½ in.). At present there are 6,131 miles of 5 ft. 3 in., 7,296 miles of 4 ft. 8½ in., and 13,011 miles of 3 ft. 6 in., and the cost of conversion has been estimated at £114,000,000. It is recorded that soon after the standard gauge of 4 ft. 8½ in. had been decided upon for the railways of Great Britain in 1846, the Colonial Office advised the Australian Colonies to adopt that gauge, and the Legislatures of South Australia and New South Wales officially concurred; but when the Sydney Railway Company decided to build the railway from Sydney to Goulburn the company's engineer, Mr. F. W. Shields, obtained approval for the adoption of the 5 ft. 3 in. gauge. Later on, in 1852, Mr. James Wallace, Mr. Shields's successor, urged the re-adoption of the standard gauge, and in 1853 a Bill was passed making this gauge the standard for the colony. Meanwhile, however, Victoria and South Australia, in agreement with New South Wales, had officially adopted the 5 ft. 3 in. gauge for their railways, and as the material had already been ordered they declined to change. Queensland later adopted the 3 ft. 6 in. gauge from motives of economy. South Australia actually has two different gauges and the Commonwealth railways are also on two gauges. The effect of the consequent break in through transport, in connection with considerations of defence, is only too obvious, and the unfortunate consequences of the lack of a co-ordinating principle at the beginning of railway development is now being perceived more clearly than ever.

It is not only in the matter of gauge that the Australian railways offer an example of the consequences of individual caprice and lack of main principle. A glance at a contoured map shows that local interests appear to have overborne the wider convenience of direct routes between capital cities, and long detours increase traffic mileage and therefore working expenses. In some cases also the present location involves severe gradients between points where an almost level line would have been practicable. Whether and where the cost of relocation and gauge unification would be compensated by economy in operation is a matter depending on so many incalculable variables in existing circumstances as to be worth consideration now mainly in the light of defence and strategic requirements. Apart from this, it might be decided that it would be better and quicker, in the end, rather than undertake the huge task of unification, to link up the principal cities with an entirely new trunk-line system on a uniform standard gauge, and abandon any circuitous lines so rendered unnecessary.

The Corrosion of Rails in Tunnels

A PERPETUAL problem to engineers concerned with the maintenance of railway track is provided by rails in tunnels, and particularly tunnels in which corrosion is accelerated by the combination of sulphur from locomotive exhaust with abnormally damp conditions. The longer the tunnel, so much the less easy is it to keep maintenance up to the standards prevailing in the open, and especially the packing of rail-joints; the result is that not only does the weakening of rail sections by corrosion compel premature removal of the rails from the track, but corrosion fatigue, encouraged by the leverage exerted by fishplates as the moving loads pass over loose joints, and possibly even further accentuated by the use of short fishplates, often makes it necessary to remove rails at an even earlier date owing to the development of cracks in the fishing or from the bolt-holes. This last condition, of course, affects chiefly the damp tunnels through which flows constant and heavy traffic; in long tunnels carrying only intermittent traffic, or tunnels in which considerable lengths of rails have been welded, the rails are chiefly affected by loss of cross-section. A report presented recently to the American Railway Engi-

neering Association by Mr. A. E. Perlman, Chief Engineer of the Denver & Rio Grande Western Railroad, shows that this problem has proved as baffling to American engineers as it is to those in this country. His system and the Denver & Salt Lake Railroad jointly own, on their Dotsero cut-off, the Moffat tunnel, a single line bore, 6·21 miles in length, which is the longest in the United States, and in which, although the trains are relatively infrequent, it has hitherto been necessary to remove 110-lb. flat-bottom rails after ten years by reason of loss of sectional strength through corrosion. In this country, however, ten years would be a considerable life in many busy tunnels in which moisture and locomotive exhaust normally limit rail life from three to five years or so.

Prolonged investigations have been made in Moffat tunnel in an endeavour to add some appreciable length of time to the average life of the rails. In order to reduce corrosion fatigue cracking, the previous 33-ft. rails have been replaced by 66-ft. rails, butt-welded into long lengths by the thermit process, so eliminating many rail-joints. Coatings about $\frac{1}{2}$ in. thick of various rust-preventing organic-base materials have been used, as well as of lubricating oil and of oil plus 5 per cent. of hydrated lime, but all the coatings were penetrated by rust in from three to six weeks. The attack was chiefly through the running surface, but this, as previously mentioned, would be accelerated by the long intervals between trains in Moffat tunnel, whereas in a tunnel carrying heavy traffic throughout the 24 hr. of the day the running surfaces stand a much better chance of remaining bright and of resisting the penetration of corrosion from the top table of the rail. Emphasis is thus laid on the fact that conditions in different tunnels require different protective measures. Mr. Perlman's final conclusion is that the only solution of his Moffat tunnel rail problem is to use a rail section unaltered in web and base profile but with an additional $\frac{1}{2}$ in. or more of metal on the top of the head to allow for abrasion and corrosion might improve matters in that particular tunnel, particularly with welded rails and relatively few trains, but we doubt if his estimate of doubled rail life would ever be attained by such means. Certainly no such result would be reached in many British tunnels, where corrosion of web and foot and corrosion fatigue cracking of rail-ends govern life to such an extent as to make it doubtful whether any added life is obtained by substituting the 100-lb. for the 95-lb. bull-head section, the web and foot profiles of these two sections being identical. In the conditions last mentioned the painting of the rail sections with suitable coatings appears as yet to be the only palliative that is at all effective; and in this connection it must be remembered that any coating which adds but a single year to a three-year rail life is a 33 per cent. addition, and so is well worth while, even though it may be only a partial solution of the problem. In this connection it is desirable that the coating at the rail-joints, where corrosion fatigue cracks mostly develop, should be frequently renewed, the fishplates being removed for the purpose so that the bolt-holes and the fishing angles of the rail receive careful attention at each repainting.

Various interesting experiments were tried in Moffat tunnel. In an endeavour to provide a neutralising reaction to acid corrosion, the freight locomotives working through the tunnel were equipped with lime feeders so that sufficient lime to react with the sulphur in the coal burned could be blown into the fireboxes and thrown out of the chimney with the exhaust. But the reduction in rail corrosion was negligible, and the lime, making a slippery deposit on the rails, caused considerable operating difficulties. Corrosion-resistant alloy steels of various kinds were tried, such as U.S.S. Cor-Ten and Man-Ten, copper-bearing steels, and heat-treated steels, but without result, thus duplicating the experience of such steels in tunnels in this country. No ferrous alloy short of a steel containing 18 per cent. chromium and 8 per cent. nickel was found to resist the corrosive conditions in Moffat tunnel; but the cost of such an alloy, even if it would stand up to the impact tests of standard rail specifications, would be prohibitive. Further, although this alloy remained untouched for 16 months, it was hung up as test-pieces on the tunnel wall, and so was not

subject to the vibration and stresses in the rails themselves which have a considerable influence on the development of corrosion. Some proof of this last fact was given to the Moffat tunnel investigators when they hung up some zinc-coated steel test-pieces, with which corrosion loss was reduced by 20 per cent. owing to the zinc coating, whereas a sand-blasted rail similarly zinc-coated corroded at exactly the same rate as the adjacent non-coated rails. The cathodic method of electrical protection was tried, and reduced corrosion by 17 to 33 per cent., but its general application on an adequate scale was found to involve a cost out of all proportion to the saving effected. For the present protective paints appear to offer the most promising field for research, applied to rails which have been sand-blasted, or, better still, treated at the last passes through the rolling-mill with high-pressure steam or water jets for the removal of mill-scale, and then immediately painted on their clean surfaces.

Steam That Does No Work

A POINT of interest mentioned in the October 24 issue of THE RAILWAY GAZETTE concerning the Great Southern Railways of Ireland 4·6-0s fitted with steam-operated Caprotti valves is that it is possible with these engines to run 20 miles out of the 165½ miles between Dublin and Cork with the regulator closed. Coasting on such a scale as this, provided that time is being maintained, obviously means economy in fuel consumption. A strongly contrasting picture was presented by Mr. Lawrence Richardson at a recent conference of the Railway Fuel & Travelling Engineers' Association in Chicago under the heading "The steam that does no work," when he contended that on some hilly divisions of American railroads 20 per cent. of the total fuel consumed is used to make steam when engines are drifting, largely by the use of the blower when running downhill. The chief purpose of this uneconomical use of steam is to lift smoke from the engine chimney, which is not merely troublesome to engine crews, but has given trouble to passengers also by being drawn into the air-conditioning plants of high speed trains.

Various improvements in front-end design, such as freer exhaust and enlarged chimneys, have added to the nuisance, as have also the shorter chimneys necessary with modern boilers, though some of the Western lines, which have loading gauges sufficiently large, have minimised the last-mentioned difficulty by fitting chimneys in height up to 16 ft. above rail. Modern streamlining of locomotives, when designed with due regard to drifting exhaust, is proving helpful, as is also the avoidance of projections on the boiler or sharp corners that produce eddy currents; but the simplest and most generally effective device consists of sheet steel smoke deflectors along the smokebox sides, as used extensively in Europe though in the North American continent to only a very limited degree so far. In this connection the paper on "Smoke Deflectors for Locomotives" recently presented by Mr. H. Holcroft to the Institution of Locomotive Engineers in London showed how important this aspect of the subject had become, and how the difficulty was being tackled in this country.

Mr. Richardson also drew attention to the importance of valve and cylinder lubrication when locomotives are drifting and said that, although not so much oil is required as when working, enough must be provided and only a small quantity of steam is needed to carry adequate lubrication to the wearing surfaces. Much research has been done to keep the "steam that does no work" to a minimum but much more remains to be done, and it is probably true to say that no field of locomotive operation offers greater possibilities for research at the present time than drifting. Referring to the functions of locomotive test plants, Mr. Richardson remarked that the difficulty in the past had been that, while such plants permitted careful study of the locomotive, they do not work in reverse nor afford an opportunity of watching performance whilst drifting. When the regulator is closed on a test plant the speed will drop from 30 m.p.h. to zero in as short a time as one second, there being, as a consequence, then practically no drifting period.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

A Turntable Extension

Perrymead View,
Greenway Lane,
Bath
December 9

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR.—I was interested to see in THE RAILWAY GAZETTE for December 5 an illustrated description of a turntable extension device in use in the U.S.A. I am not sure if this is regarded as a novelty, but, if such is the case, I would mention that my late father, Mr. A. Whitaker, took out a patent for a similar arrangement 54 years ago (Patent No. 7558, May 25, 1887). In this case the extension rails were hinged to the table, counterbalanced, and coupled together, so that one movement brought both extension rails into action. These extension rails were usually referred to as "Crocodiles" and were on turntables of the Midland Railway for many years; they were discarded only when larger tables were installed.

Yours truly,
A. H. WHITAKER

Calling-on, Draw-ahead, Shunt-ahead, and Warning Signals

7, Elm Grove Road, Exeter
December 13

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR.—The article in THE RAILWAY GAZETTE of December 12 draws attention to the curious revision in 1937 of some of the rules relating to lower arm subsidiary signals. The criticism appears sound and a reversion to pre-1937 calling-on signals to be desired. It may be observed that the definitions for calling-on, warning, and shunt-ahead signals suggested by your correspondent are clearer and more concise in form than the three definitions in the current Rule Book.

If the draw-ahead signal is merely another name for a calling-on signal in certain circumstances, not only does the advantage seem questionable but the disadvantage of introducing "a new and rather fine distinction" is manifest. One company sometimes uses a ground signal instead of a lower arm subsidiary signal and it would appear that the same signal (not merely the same form of signal) may be used as calling-on, draw-ahead, warning or what the Rule Book rather inaptly describes as shunting signals. Draw-ahead would not have been an unsuitable name for these signals, but the calling-on function is definitely excluded by the Rule Book.

Whatever the intention, the justification for changing the calling-on signal rule is obscure. As to the provision of warning signals for movements within station limits, practical reasons might be that the stop signal was locked as a result of the line

being fouled ahead of the next stop signal in advance, or difficulty in carrying out Rule 39 (a), particularly at night. Also, when a stop signal has a warning arm beneath, and the purpose of the latter is evident when in the "on" position, the stop signal in the "off" position is of additional significance to the driver of a train which has been brought to a stand at it. It seems desirable that each stop signal should be primarily considered as such for normal working, and the less it is necessary to refer to stop signals in particular positions the better: this conception of the stop signal much reduces any objection which might be raised against placing an additional distant signal other than to the rear of the home signal of the same signal box.

Your correspondent remarks upon the absence of any explicit definition of a section in the Rule Book. The omission to define stop and distant signals adequately is perhaps even more remarkable. When conditions justify the work, the Rule Book might well be revised and re-arranged in conjunction with the Appendix thereto and the Block Regulations. Pending such revision it is to be hoped that the amendments made are necessary or advantageous and are as clear as possible in expression and intention.

Yours faithfully,
G. N. SOUTHERDEN

Westminster's Paper Salvage

Mayor's Parlour,
Westminster City Hall,
Charing Cross Road, W.C.2
December 12

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR.—I have gratefully accepted the generous offer of an anonymous donor to give to charitable organisations for seamen, soldiers, and airmen the sum of £10 for every ton of paper collected in the City of Westminster during the week commencing Monday, December 15. The necessity for this National Effort calls for no emphasis on my part. I am certain that there are many tons of unwanted books, technical journals, paper, and cardboard still lying dormant on shelves, in filing cabinets, and in strong rooms. The country needs urgently every old ledger, letter-book, invoice, or receipt, all old correspondence—and NOW. If you have any arrangements for the collection or disposal of your surplus paper through the usual waste paper merchants please let this continue, but add to the amount they collect. The merchants will notify us of the weight that has been collected. I appeal most strongly for support for Westminster's effort to obtain every available pound of waste paper and at the same time reap many pounds for the benefit of our gallant Services.

Yours very truly,
W. STANLEY EDGSON,
Mayor of the City of Westminster

PUBLICATIONS RECEIVED

Australia : Official Annual.—Issued with the authority of the Minister of Commerce by the Australian National Publicity Association, Railway Buildings, Findon Street, Melbourne, Australia, this publication tells the story of the progress and development of the world's youngest civilisation in the world's oldest continent, and contains a great deal of information on all phases of Australian life. The transport and communications section shows that Australia is served by nearly 28,000 miles of railways, 30,000 miles of scheduled air routes, about 114,000 miles of made roads, and 367,000 miles of roads that have been formed or cleared, and a fleet of passenger liners connecting all the State capital cities and linking them with minor ports right round the 12,000 miles of coast line. In addition, there are 304,000 miles of telegraph channels interlinking 9,450 telegraph offices, and 3,121,000 miles of wires in the telephone exchange and trunk line telephone systems. A table incorporated in the book shows all the principal statistics relating to Australian

Government railways from 1938-1939. The whole handbook is very well produced and contains some excellent illustrations of Australian activities and past times.

Daily Mail Year Book, 1942. London : Associated Newspapers Limited, Carmelite House, E.C.3. 5 in. x 7 in. 240 pp. Price 1s. 3d. net.—The latest issue of this valuable reference book covers all the personalities and events of recent times. As always it gives a summary of developments at home and abroad, and contains a wealth of detail which normally would call for the provision of a number of larger works of reference. Despite wartime conditions it has been found possible to keep the book remarkably up-to-date in its contents. It contains a review of the British railways' wartime activities, and some notes on London traffic and operations of the London Passenger Transport Board. Among its comments on new tasks for women in wartime it gives some figures relating to the number of women employed by the railway

companies and London Transport. On this occasion, too, it deals with damage wrought by air raids, and gives details of a number of the more important buildings which have suffered at the hands of the enemy.

Noral Technical Publications.—The demand for accurate, up-to-date information on aluminium technology has increased as a result of the wartime expansion of industries concerned with the working and treatment of aluminium alloys.

To meet this demand, the Research and Development Department of the Northern Aluminium Co. Ltd. has compiled a number of publications.

Those available at present are entitled "Gravity Die Castings in Aluminium Alloys," "Cold Forming of High Strength Aluminium Alloy Sheet," "Machining of Aluminium Alloys," "The Heat Treatment of Aluminium and its Alloys," "Protection of Aluminium Alloys during storage," and "Specifications for Aluminium and Aluminium Alloy Products." Copies may be had on application to the Technical Publications Department of the Northern Aluminium Co. Ltd. at its Banbury (Oxon.) office.

THE SCRAP HEAP

IRON BRIDGE FOR SALE

At Plymouth, a wrought-iron bridge, 125 ft. long, rail 6 ft. high, roadway 12 ft. wide, constructed by G. Hennet & Co., from designs by the late Mr. Brunel, is in first class condition, strong, capable of carrying 50 tons. To be sold at a bargain. Apply to the Dockmaster, Plymouth Great Western Docks, Plymouth.—An advertisement in "Herapath's Railway Journal," for October, 1863.

* * *

Pigeons are being discouraged from making their homes along outside edges of the roof of Pennsylvania station, New York. Chief weapon of the railway is an anti-pigeon device—consisting of a mass of upright wires on which no pigeon can find a comfortable roost—which it is now installing in strategic zones. The upright wires will harm the birds in no way, but (as one newspaper reporter put it) would merely encourage them to hop off and seek hospitality at some other building—Grand Central terminal, for instance.—From the "Railway Age."

* * *

One-way traffic is no new thing in some parts of Glamorgan. Before the opening of the Rhondda & Swansea Bay Railway the people of Cwmavon often travelled to Aberavon in a kind of guard's van on the old railway which went down the gradient with only the brake to control it. They had to return through Blackwells and Pant-du the best way they could.—From the "Western Mail."

* * *

TRAVEL PRIVILEGE

Lord Reith, Minister of Works and Buildings, plans a "better Britain" sitting in a guard's van as he travels from London to Beaconsfield, Bucks, each day.

When first-class compartments were taken off the line the Minister got into the guard's van. He was followed by other passengers who ignored his protests that they could not travel with him. So the next day Lord Reith was locked in before other travellers could storm his stronghold. He works on the desk normally used by the guard when sorting mail. The L.N.E.R., at the request of the Ministry of War Transport, granted Lord Reith a special permit to travel in the brake.—From the "Sunday Express."

* * *

AN OBLIGING RAILWAY

While the Cheshire Lines is certainly one of the smallest railways in point of length, there is no doubt that in its own line, so to speak, it is one of the most obliging railways. In pre-war days, for instance, it went to quite a lot of trouble to run a midnight special train from Stockport to Delamere, free of all cost to the passengers, who were a number of Irishmen who, admittedly by their own fault, had boarded the Stockport express at Chester instead of the slow train stopping at Delamere. That the war has not altered its obliging policy is shown by the recent example of an R.A.F. officer who turned up at Cheadle Station shortly before midnight in the optimistic hope that there might be a train to carry him to his depot some twenty miles away. The station was in fact closed, but the courteous signalman in the cabin near by immediately got in touch with his Liverpool headquarters. Within ten minutes authority was given to stop an express

"light" engine, and the pleased officer was given a seat of honour on the footplate. "But," said headquarters, "you must tell the officer that this is an extra-special case, and he mustn't expect us to do it again."—From "The Manchester Guardian."

* * *

CULTURE FOR "COMMUTERS"

A strange school is the university course established by the Pacific Electric Railway, in Southern California, for season-ticket travellers ("commuters") who travel daily between Los Angeles and their homes in the suburbs. Each passenger may, when he renews his monthly "season," enrol for a train correspondence course in any one of nineteen selected subjects. Lessons are obtained from the booking office in loose-leaf form, and each is just long enough to fill in the thirty or forty minutes' daily travel. Examinations are held periodically and diplomas granted. These passengers regard themselves as a cut above the crossword fans and Edgar Wallace devotees who somewhat shamefacedly pursue their lowbrow pleasures in the same compartments.—From "The Manchester Guardian."

* * *

The sharp difference which exists between proceedings in the United States and in this country is emphasised by a report which appears in the *Railway Age* of the hearing on October 1 before the special Senate committee investigating the alleged petrol shortage in the eastern seaboard. Mr. Harold L. Ickes, the Federal Petroleum Co-ordinator, denounced Mr. J. J. Pelley, President of the Association of American Railroads for testimony he had given, and here are some examples of the language used by Mr. Ickes:

"I suggest to the American Railroads, as a test of their patriotism and as proof that they repudiate such a disservice as Mr. Pelley has committed them to, that they recall Mr. Pelley and his storm troopers from Washington and render him powerless to commit further mischievous

acts. . . . In all candour, gentlemen of the committee, Mr. Pelley owes not only to you, but to the American people whom he has wantonly and maliciously deceived, an abject apology. Mr. Pelley has imposed upon you. Mr. Pelley has trifled with a serious situation. Mr. Pelley has confused the public mind; he has stood in the way of national unity at the most critical time in our history. Mr. Pelley has shown that he is willing to sacrifice the safety and security of his own country for the base purpose of preventing transportation facilities that could undersell the railroads. . . . Your committee has issued a report which has gravely handicapped the programme of the Petroleum Co-ordinator's office, and the major findings of that report were predicted in large measure upon the so-called 'studied opinion and serious promises' of a man who has now been proven to have given testimony which was utterly without foundation—and I believe he knew that it was without foundation."

However, after about two hours of violent denunciation of this kind the Chairman, Mr. Maloney, quietly said that he "had complete confidence in Mr. Pelley" as he had known him for many years.

* * *

COST OF B. & E.R. ROLLING STOCK

An extract from "The Fact Book," which has been kept by the Divisional Engineer, Plymouth, G.W.R., and his predecessors for nearly a century.

First class	each	£650
First and second composite	..	£530
Second class	..	£500
Third class	..	£400
Horse-boxes	..	£190
Carriage trucks	..	£130
Mail vans	..	£600
Parcel and meat vans	..	{ £350 £140
Goods wagons, tilt box, and cattle	..	£137.10.00
Timber wagons (6 wheels)	..	£145
do. do. (4 do.)	..	90
Coal wagons	..	£120
Luggage break vans	..	£350
Permit. way ballast wagons	..	£110
do. rail trucks	..	£145
do. timber	..	£90
Coke wagons	..	£110

(This information obtained from Mr. Fripp, March 21, 1864)



"Rabbit, Sir?"

[Reproduced by permission of the proprietors of "Punch"]

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

SOUTH AFRICA

Lower Rates for Household Foodstuffs

The Minister of Railways & Harbours, Mr. F. C. Sturrock, has made an important announcement on the administration's contribution towards easing the cost of living. With effect from October 22, reductions of 50 per cent., 33½ per cent., and 25 per cent. have been made on the rates for certain commodities selected as representing foodstuffs commonly in household use, and with regard to the fact that smaller percentage reductions spread over a wider range of commodities would be so fractional as to have little influence on prices. As a result of this action by the administration the Controller of Prices has announced that new prices, providing for the passing on to the consumer of these reductions, will be issued immediately.

Tourist Traffic

After two years of war the tourist traffic of the Union is being well maintained. In 1938 there was a record entry into the Union of 39,922 persons, in 1939 the number was 34,659, and in 1940 it was 33,140. For the first half of 1941 the number was 17,378. Most of the traffic is now from African territories. Whereas the pre-war visitor from Europe and America confined his expenditure to immediate personal requirements, a large proportion of the present visitors stay for a long period and spend money on South African goods and services. In the annual report of the Johannesburg Publicity Association for 1940, it is contended that the *per capita* value to the Union of the war-period visitor is greater than that of the pre-war visitor. Many thousands of South Africans who would normally have gone overseas are now compelled to take their holidays in the Union.

Another Revenue Record

A new revenue record has been established, that for the week ended October 4 totalling £847,838. The previous record set up in the week ended September 20 last was £810,255. The earnings for the week exceeded those of the corresponding period of 1940 by £162,430.

CANADA

C.N.R. May Use Alberta Oil Fuel in Locomotives

In a recent interview Mr. R. C. Vaughan, President of the C.N.R., stated that substantial quantities of oil from the Wainwright and Vermilion fields, in Alberta, could be used by the Canadian National Railways if the quality was found to be satisfactory and prices acceptable. He added, however, that none of this oil had so far been delivered to the railway, as facilities had first to be established for treating the product for use in locomotives.

CHILE

State Railway Finance

The question of the finances of the State Railways is again receiving the attention of the Government. The proposal for the issue by the Central Bank of Chile of an obligatory 3 per cent. loan of 250,000,000 pesos, is criticised as involving a tendency to inflation. The Minister of Finance proposed an issue of bonds of the internal loan, but it seems that such an issue would

not be taken up at anywhere near the nominal value, and the railways would be expected to bear the burden of the discount. The first expedient, a loan from the Central Bank, is considered to be preferable to the bond issue. Meanwhile, an obvious temporary solution would be for the Government to relinquish its statutory 7 per cent. proportion of earnings (35,779,790 pesos in 1939) and the equally onerous contribution for *Protección Social*, until the financial position of the railways becomes stabilised. Another indispensable factor is the regulation of road competition.

Railway Radio

A recent Decree of the Ministry of the Interior confirms the right of the State Railways administration to establish and operate wireless telegraph and telephone stations for private two-way communication between the points served by its railways and steamers, and assigns frequencies and call letters to the several stations.

CEYLON

Closure of Chilaw-Puttalam Line Recommended

An estimate of the cost of dismantling the Chilaw-Puttalam section is now being prepared as a preliminary step towards recommending that it be closed down. If this recommendation is adopted, this will be the third and longest section of line to be closed for lack of traffic. The first section to be dismantled was the Uda-Pussellawa, and the second, which is to be closed from the beginning of next year, is the Yatiyantota line. The length of the Chilaw-Puttalam section is 32 miles, and it has been run at a loss almost from the time it was constructed, mainly due to the fact that it runs parallel, throughout its entire length, to the high road and the canal. The Minister of Communications & Works is to move in the State Council that this section be closed as from December 1.

Coal Situation Eased

The coal position has been relieved as a result of the arrival of another shipload from India. Over 8,000 tons have now arrived, and further large consignments, which have been delayed, are expected shortly. District centres are to be provided with larger supplies of coal than have been possible for the last two months; all their reserves of coal were brought to Colombo to meet the shortage.

Transportation Expert Recommended

It is understood that the Secretary of State for the Colonies has informed the Ceylon Government that Mr. Nelson, a railway expert in the service of the Ministry of War Transport, will be available to Ceylon for the purpose of supplementing the work of the Hammond Commission by investigating existing transport problems and preparing a scheme for the co-ordination of road and railway traffic. It is proposed that a salary of £2,500 *per annum* should be paid to this officer with free passages from and to England and other privileges such as leave and other allowances. It is understood that Mr. Nelson recently undertook a similar mission to the Federated Malay States.

The Executive Committee of Communications & Works will probably consider the proposal to secure the services of this officer at its next meeting on September 23.

The proposal to engage the services of

an expert to advise the Government on the co-ordination of rail and road transport was agreed upon at the conference between the Governor and the Board of Ministers on the budget shortly before its introduction in the State Council during August. At a recent meeting of the State Council a motion for the appointment of an expert was carried by 18 votes to 7.

Train Vestibule Connections to be Removed

The vestibules connecting the carriages of long-distance trains are to be done away with gradually as a wartime retrenchment measure. The special canvass and other materials necessary for effecting their repairs are no longer obtainable, and as a result difficulty is being experienced in maintaining them. There has also been a heavy toll of vestibules during the past year or two since firewood began to be used as fuel for the engines, and sparks have been responsible for the outbreak of numerous fires in trains; a large number of vestibules have been destroyed in this manner.

THE FAR EAST

Public Welfare Trains, North China Railway

So successful was the North China Railway's Public Welfare train last spring, that another is making a tour this autumn of the Tientsin-Pukow, Tsingtao-Tsinan, Peking-Hankow (northern part) and Shihchiachwang-Tehchow sections of the system. The object of these trains is to bring comforts and amenities to railway employees and villagers scattered along the lines traversed, the necessities of daily life being carried and sold to them at reduced prices. The train left Peking on September 20 and is due to return there on December 17.

New Air Service to Bangkok

The Dai Nippon Airways inaugurated a second regular air service between Tokyo and Bangkok at the end of October. The route followed is *via* Tansui and Saigon, a distance of 5,680 km. (about 3,520 miles) which is covered in 24 hr. The earlier Japan-Thai air route is from Tokyo *via* Fukuoka, Canton, Hanoi, and Saigon to Bangkok.

SWITZERLAND

Federal Railways 1942 Budget

The Swiss Federal Railways' second wartime budget clearly shows the effect of world events on this neutral and, now to a great extent, isolated country. The difficulty of obtaining raw materials from abroad and the high cost of those available have placed even stricter limits than usual on the construction programme, and only work of a really urgent nature is to be undertaken. Even so, the total expenditure for completion of works in hand, new works, and purchase of rolling stock is estimated at fr. 26,851,500, or slightly over the 25-million limit adhered to since 1937. The cost of construction work has now increased by about 20 per cent., and for rails the increase is over 100 per cent. More extensive electrification and widening schemes, though urgent in view of the heavy traffic, are, therefore, out of question for the present.

Works to be continued or completed include:

(a) Doubling: Sisikon-Fluelen, Taverne-Lugano, Auvernier-Boudry.

(b) Construction of the Geneva connecting line (Cornavin-La Prairie section).

(c) Electrification: Zurich-Oerlikon-Wettigen, Auvernier-Verrières, (both almost completed in 1941).

December 19 & 26, 1941

(d) Improvements at Basle (S.B.B.), Liestal and Burgdorf stations.
 (e) New signalling at Solothurn, Weesen, and Rüti.

New Works

The principal new works are :—

- (1) Doubling from Rapperswil to Lenzburg.
- (2) Electrification of the Winterthur-Neuhauen line.
- (3) Reconstruction of bridges on the Wattwil section.
- (4) Improvements or extensions at Brigue, Erstfeld, Chiasso, Richterswil, Winterthur, and St. Margrethen.
- (5) Colour-light signalling at Zollikofen, Baar, and Baden.

The Winterthur-Neuhauen section is part of the only route from Zurich to Schaffhausen entirely in Swiss territory, the electrified main line via Bülach-Eglisau running through Germany for a short distance, and being, therefore, subject to restrictions and interruptions. The widening of the Rapperswil-Lenzburg section will provide double-track throughout from Basle to Wohlen *via* the east curve at Olten, which is the route followed by goods trains for the Gotthard line.

In addition to the above works, doubling of the Roches-Choindez, Winterthur-Räterschen, and Goldach-Rorschach sections is proposed, but only a nominal sum of fr. 1,000 appears for each item in the 1942 budget, as these schemes are not likely to be proceeded with until matters improve.

Provision of New Rolling Stock

An amount of fr. 12,329,000 is allotted for rolling stock purchases, which are to include : 2 heavy or 4 to 5 light electric locomotives, 20 standard-gauge coaches, 8 metre-gauge coaches (Brünig line), 156 goods wagons, and various shunting engines or light tractors.

During 1942, 5 steam locomotives, 20 coaches, 10 vans, 100 wagons, 20 service vehicles, and 5 tractors are to be scrapped, and the total rolling-stock figures (excluding the Brünig line) by the end of the year should be as follow :—

516 electric locomotives
365 steam locomotives
3 diesel locomotives
64 motor-coaches and railcars
161 light tractors
3,524 coaches
658 vans
17,581 goods wagons

Traffic Estimates

For an estimation of the traffic receipts it was not considered possible to take as a basis, as in former years, the receipts for the first half of the previous year, as under wartime conditions current events have very marked effects on traffic. An average has, therefore, been taken of the receipts for 1938-39-40—one pre-war year, one of crisis, and one of wartime conditions—and a sum of fr. 347,000,000 has accordingly been arrived at. The following figures in millions of francs are compared with those for 1929, the record year since 1903 :—

	1929	1938	1939	1940	1941 (probable)	1942 (budget)
Receipts—						
Passenger	156.2	131.9	133.6	136.2	155	134
Goods, livestock, mail, and baggage	245.7	175.7	214.2	247.8	265	213
Percentage	401.9	307.6	347.8	384.0	420	347
	100	76.5	86.5	95.5	104.5	86.3

Expenditure for maintenance has been kept a little over the 1940 figure, but the higher cost of materials and fuel mainly accounts for an increase of some fr. 20,000,000. For comparison with 1930, when working expenses reached their highest figure since 1923, the following totals are given :—

	1930	1938	1939	1940	1941 (probable)	1942 (budget)
Working expenses	291.4	229.5	223.9	238.8	264.0	261.3
Percentage	100	78.8	76.8	81.9	90.6	89.7

The estimated deficit amounts to fr. 51,100,000, due in part to factors already mentioned, and also to a revision of rates of depreciation on installations, certain of which have hitherto been subject to no depreciation or to insufficient depreciation ; a sum of fr. 20,000,000 is set aside to cover the additional charges involved.

NORWAY

Main Line Electrification

Main line electrification in Norway as well as in Sweden is being continued, and even speeded up, in view of the fuel situation. In Norway, the main line from Oslo to the Swedish frontier at Kornsjø is now in electric operation, and the total length of electrically-worked sections in Norway, including the Narvik line, is at present 495 km. (377 miles), which is 13 per cent. of the total railway mileage ; 40 per cent. of the train-mileage is now electrically worked, and this percentage is being increased by more drastic curtailments of steam-operated services than of those electrically worked. The Nordagutu-Neslandsvatn section, 75 km. (47 miles), of the Kristiansand main line, which takes off from the already electrified Oslo-Skien line at Nordagutu, is being electrified, and so is the Myrdal-Flaam branch, now under construction, 20 km. (13 miles), taking off the Oslo-Bergen main line. This main line is not electrified, and the new branch will constitute an isolated section, similar to the other electrified branch of the same main line, from Voss to Eide. It is hoped to bring the new sections into operation early in the new year.

SWEDEN

Financial Demands of the State Railways

The financial demands just put forward by the Swedish State Railways for new plant, electrification, and rolling stock, amount to Kr. 65,885,000, of which Kr. 19,600,000 are for rolling stock, Kr. 1,500,000 as an additional allocation towards the cost of the new ferry boat, Kr. 19,000,000 for electrification, Kr. 10,000,000 for line doubling, Kr. 4,700,000 for renewal of rails, and Kr. 2,000,000 for new signals and interlocking.

Electrification

The above-mentioned allocation towards the electrification envisages the completion of the conversion now in progress of the following sections : Helsingborg-Hässleholm, 78 km. (48 miles), Helsingborg-Eslöv, 50 km. (31 miles), Sundsvall-Ange, 95 km. (59 miles), and Gävle-Ockelbo, 38 km. (24 miles). It is expected that the electrification of these sections will be completed by the spring of 1943. To carry

(29 miles), from Stockholm to Katrineholm, a distance of 86 km. (53 miles); (b) from Pälshöda, 184 km. (114 miles), from Stockholm, to Hallsberg, a distance of 14 km. (9 miles); (c) from Låxa, 228 km. (141.59 miles) from Stockholm, to Gårdsjö, a distance of 23 km. (14 miles), and (d) from Skövde, 312 km. (194 miles) from Stockholm to Falköping, a distance of 30 km. (19 miles). Also on the Stockholm-Malmö main line one section is being doubled from Mjölby, 241 km. (150 miles) from Stockholm to Tranås, a distance of 37 km. (23 miles). It is expected that the doubling on the Låxa-Gårdsjö and Järna-Katrineholm sections will be completed during 1943.

Rolling Stock

For long-distance traffic 60 third class bogie all-steel coaches with an aggregate seating capacity for about 5,000 passengers are to be ordered, and in addition 7 composite third class and baggage coaches, 30 baggage vans, and 3 restaurant cars. These orders will account for an expenditure of Kr. 12,000,000, of which Kr. 5,500,000 will come out of the Renewal Fund. A further Kr. 5,600,000 is required for the purchase of goods wagons.

SPAIN

Increase of Railway Transit Rates

Like the ordinary railway goods rates, as reported, which were increased by 25 per cent. as from October 23 last, transit goods rates have also been increased to the same level as the inland rates. As this increase entails in most cases a doubling or even quadrupling of these rates, the trade of the European countries mainly depending on transit traffic through Spain has thereby been severely hit. It should be noted, moreover, that these new increases came on top of two previous increases of 15 per cent. each, introduced in 1918 and 1934 respectively.

The Locomotive and Rolling Stock Position

The Spanish railways owned 2,917 broad gauge locomotives and 73,854 broad gauge vehicles of every description before the civil war, but during that war the stock was reduced by about one-third, namely, to 1,759 broad gauge locomotives and 49,050 broad gauge vehicles all in a poor state of repair. By the end of 1940, however, the stock had been increased by 501 new locomotives and 7,500 vehicles, all Spanish-built. Meanwhile, 589 locomotives and 18,000 wagons and coaching vehicles underwent repairs in 1940.

No production figures for locomotives and rolling stock have been published for 1941, but it is known that the firms of Babcock & Wilcox of Bilbao, Compania Naval of Bilbao, and Maquinista de Barcelona are doing their best to increase their output of locomotives and rolling stock.

Railway Wages Increase

By a decree approved by the Cabinet on September 26, an increase of 45 per cent. will be applicable to all wages not exceeding 12½ pesetas a day (8s. 3d.) and the equivalent salaries of all the permanent employees of the National Railway system. This, it is calculated, will involve an additional expenditure of 140,000,000 pesetas (equal to about £3,500,000 sterling), to be compensated, in part, by an increase in tariffs, approved by a second Decree of the same date, which, however, provides for certain exceptions in the case of essential food stuffs.

BALANCING OF LOCOMOTIVE RECIPROCATING PARTS

Summary of a paper by Mr. E. S. Cox, Chief Technical Assistant to the Chief Mechanical Engineer, L.M.S.R., presented to a joint meeting of the Institutions of Civil and Mechanical Engineers on December 16

THE fundamental theory of locomotive balancing was formulated by Nollau in 1847; two years later Le Chatelier, of the Orleans Railway, worked out its application with the help of experiments with an engine slung clear of the rails and run up to a speed of 3 r.p.s. In this country D. K. Clark laid down rules, based on Le Chatelier's work, which have been generally followed since, and a simple graphical demonstration of this theory has been made by Prof. Dalby before the Institution of Mechanical Engineers.

It is universally agreed that revolving masses should be completely balanced; but there is divergence of opinion as to how the reciprocating masses are to be dealt with. If they are left unbalanced, there is an alternating longitudinal force exerted on the frame of the engine together with a couple tending to set up nosing. If they are balanced by means of revolving weights in the wheels, the centrifugal effect of the weights sets up a variation in rail pressure, or hammer blow, once per revolution.

Locomotive balancing was thoroughly investigated, as regards the vertical forces, by the British Bridge Stress Committee, whose report, published in 1928, recommended that all future locomotives should be so designed that at a speed of 5 r.p.s. the axle hammer blow will not exceed one-fourth of the static load, or 5 tons as a maximum; and that the hammer blow of the engine as a whole should not exceed $12\frac{1}{2}$ tons. It is the object of the present paper to record British practice and experience affecting vertical hammer blow as observed since 1928; to examine the horizontal effect of unbalanced reciprocating masses on the locomotive itself; and to discuss the proportion of those masses which it is necessary to balance in various circumstances.

Existing British Practice

Table I gives the hammer blow values of representative British locomotives. On two-cylinder engines the usual practice for many years has been to divide the weight required to balance the reciprocating parts equally among the coupled wheels, with the object of lessening the hammer blow per wheel and per axle.

Three-cylinder engines having cranks at 120 deg. are dealt with in two different ways. The L.M.S.R. balances two-thirds of both inside and outside reciprocating weights, the whole amount being equally divided between the coupled wheels. There is thus in each wheel a component for inside cylinder, outside cylinder, and cross-couple. The resultant balance weight and hammer blow effect is in nearly opposite directions in the left-hand and right-hand wheels (Fig. 1); so that while there is an appreciable blow on each wheel and each rail, there is only a negligible amount on each axle and on the engine as a whole.

Such an engine, although exerting a smaller hammer blow per rail than a 2-cylinder engine, by reason of its lighter reciprocating parts per cylinder, is nevertheless inferior to a 4-cylinder engine, and it will be noticed from Table I that the L.M.S.R. 3-cylinder 4-6-0 engine of Class "5X" exerts as great a hammer blow per wheel and per rail at 5 r.p.s. as does the larger and more powerful 4-cylinder "Coronation" engine at 8 r.p.s.

The method adopted by the L.N.E.R. is to distribute the outside balance among all the coupled wheels in the usual way, but to balance the inside reciprocating parts in the main driving wheels alone. This has two results. First, because there is no component for the inside cylinder in the leading and trailing wheels, the left-hand and right-hand wheel blows, instead of being almost exactly opposite as in the case of L.M.S.R. locomotives, are now approximately 120 deg. apart, so that instead of an inappreciable axle hammer blow, there is a very definite variation in load. Second, since the whole

of the inside balance is in the driving wheels—and this is, of course, much heavier than the one-third of the outside weights balanced therein—the inside balance weight becomes master of the situation, and the axle hammer blow on the driving wheels occurs in the opposite direction from that on the leading and trailing wheels, as shown in Fig. 2. There is, in consequence, a considerable reduction in the whole engine blow. It is for the bridge engineer to say which is the better of these two methods, if like be compared with like.

In the case of 4-cylinder engines, driving on to a single axle and having adjacent inside and outside cranks at 180 deg., and left- and right-hand pairs at 90 deg. to each other, the reciprocating parts on each side balance one another almost completely; but balance weights are introduced to deal with the cross-couple, the required weight usually being equally divided among the coupled wheels. The hammer blow per axle per engine is thus nil, but there is a small blow per wheel and per rail. Where the drive is divided, the inside cylinders driving the leading axle, and the outside cylinders the intermediate axle, the same remarks hold good, provided that it is assumed that the side rods adequately keep the two reciprocating systems in phase. Such an assumption is made in L.M.S.R. design, the small amount of play which develops in the side rod bushes having a negligible effect.

The G.W.R., unlike the L.M.S.R., divides the inside balance between leading and trailing wheels only, and the outside balance between intermediate and trailing wheels. This is done with the object of reducing stresses in side rods and frames; but, as will be seen from Table I, it results in a definite blow per axle, as against no blow by the L.M.S.R. method. Fig. 2 shows how the maximum hammer blows per wheel occur in opposite directions on adjacent wheels so that the total blow per rail is small.

The various methods of distributing the reciprocating balance among the coupled wheels may give certain small advantages in one direction, usually at the expense of small disadvantages in another; but for given reciprocating weights and a given percentage of masses balanced there is no evidence that either the gains or losses are of a decisive nature.

Where slidebar hammer blow is taken into account it is not strictly a hammer blow in the same sense as that due to the revolving weights, but is rather a variation in pressure acting on the frame of the engine through the slidebars. This is due to the fact that the centres of percussion of gravity and of the big end are not coincident, and it usually acts in the opposite direction to the hammer blow in the wheels.

Coupled Wheel Lifting

Capacity for high speed has also produced in the last few years bouncing of the coupled wheels on the track. This first came to light in the U.S.A. about 1937 when running speeds were being increased with existing locomotives higher than they had ever been before. American practice has differed from British in paying less attention to cross-balancing of rotating parts, and although it has been customary to balance only low percentages of reciprocating parts, this has been offset by the usually much heavier weight of those parts. Resultant hammer blows have thus in some cases been excessive.

In this country no authentic observation had been made of similar occurrences, but from time to time rather mysterious cases of bent rails occurred—evidence which seemed to connect with the slipping of the coupled wheels of locomotives and an investigation was put in hand as described below.

Coupled-wheel lifting tests were carried out by the Research Department of the L.M.S.R. Two 2-cylinder 4-6-0 mixed traffic engines of Class "5" were selected having 66·6 per cent. and 50 per cent. balance respectively, while a

TABLE I—HAMMER BLOW PARTICULARS FOR VARIOUS ENGINES

Type of engines	Reciprocati-			Percentage balanced			Speed			Hammer blow			Slidebar hammer blow			Whole engine hammer blow, tons			Weight of engine in working order, lb.
	No. of cylinders	In-side, lb.	Out-side, lb.	In-side	Out-side	R.p.s.	M.p.h.	Lead-ing, tons	Inter-medi-ate, tons	Trailing, tons	Per axle	Inter-medi-ate, tons	Trailing, tons	On either side, tons	Whole engine, tons	Total hammer blow per rail, tons	Weight of engine in working order, lb.		
I.M.S.R.—																			
4-6-2 Coronation	4	698	663	47.3	49.8	5	72	1.31	1.31	1.31	Nil	Nil	0.48	0.24	3.47	0.24	242,144		
4-6-0 Class "5X"	3	751	750	66.6	66.6	5	115	3.35	3.06	2.39	Nil	1.23	0.61	8.88	0.61	8.31	0.61		
4-6-0 Class "5"	2	—	933	—	50*	5	64	7.84	7.84	0.59	0.59	2.27	0.18	21-20	1.56	178,192			
2-6-4 T No. 2500	3	716	621	66.6	66.6	5	103	2.95	2.95	3.50	8.95	1.24	1.47	7.59	9.10	161,504			
2-6-4 T No. 2537	2	—	733	—	66.6	5	61	7.55	7.55	2.36	0.01	0.01	0.01	1.17	1.40	21-30	206,640		
I.N.E.R.—																			
4-6-2 Class "A4"	3	593	517	40	40	5	71	1.33	2.16	2.16	1.16	1.16	0.63	0.21	4.74	0.70	230,608		
2-6-0 Class "K3"	3	585	533	60	60	5	114	3.41	5.53	3.41	2.97	4.00	1.61	0.54	12.13	1.79	162,624		
2-6-2 T Class "VI"	3	549	508	60	60	5	97	2.10	3.50	2.10	1.88	2.46	1.90	0.05	7.10	1.30	194,880		
G.W.R.—																			
4-6-0 "King" class	4	594	527	34.2	41.8	5	70	1.50	1.79	1.00	2.80	2.03	0.77	Not allowed for Do.	0.71	1.54	199,360		
4-6-0 "Hall" class	2	—	800	—	69.9	5	111	3.84	4.58	2.56	7.17	5.20	1.98	1.83	11.23	13.48	168,000		
2-6-2 T No. 5101	2	—	731	—	66.6†	8	61	1.77	2.03	1.77	1.63	1.23	0.13	18.20	3.32	10.05	175,728		
S.R.—																			
4-6-2 "Merchant Navy" class	3	764	798	Nil	Nil	5	66	2.10	1.04	2.10	0.89	1.76	0.89	—	—	—	207,200		
4-6-0 "Lord Nelson" class	4	533	567	40	40	5	70	R 0.43	0.86	R 0.43	0.89	—	0.58	{ 4.17	4.10	187,040			
4-6-0 "King Arthur" class	2	—	934	—	40	5	70	R 1.0	5.39	R 1.0	2.66	2.28	—	{ 1.71	1.40	10.5	—		
4-6-0 "Schools" class	3	606	563	30	30	5	113	2.20	2.20	2.20	1.10	4.50	2.28	1.48	4.40	1.40	181,328		
								5.71	5.71	5.71	3.38	3.08	3.08	1.19	6.72	7.42	150,304		
								5.80	5.80	5.80	7.90	7.90	7.90	0.10	17.20	18.42	—		
								1.44	1.44	1.44	0.10	0.10	0.10	0.06	2.87	0.27	—		
								1.68	1.68	1.68	3.68	3.68	3.68	0.15	7.35	0.69	—		

* Earlier engines of this class have 66.6 and 55 per cent balanced

† Some of these engines have 85 per cent balanced

third was specially altered to have only 30 per cent. Rail heads on a specially selected length of track were greased to promote slipping, and the equivalent slipping speeds were measured accurately by means of a slow-motion cinematograph camera, taking 64 frames per second, the camera also serving to obtain a photographic record of the movements of the wheel on the rail. Slipping speeds up to 110 m.p.h. were obtained, the engines moving along the rails at speeds from 10 to 18 m.p.h. The results obtained are set out in Table II. The bouncing of the wheels caused severe damage to the track, the rail being bent by the succession of wheel impacts in such a way that the ends tended to lift above the level of the middle portion. The ballast was damaged so that permanent settling of the track occurred. In all the tests the amplitude of the vertical oscillation of the driving wheels was greater than that of the leading or trailing wheels, although the hammer blows are the same. This appears to be due to the position of the driving wheels near the centre of the deflected length of the track. The following are the deductions which were made from the experiments:

(1) The bouncing of the wheels is of the nature of a forced vibration resulting from the unbalanced forces, and is not one of resonance between engine and track.

(2) The wheels lift in these circumstances at rather lower speeds than indicated by theory, in which upwards centrifugal action of the balance weight and the downwards static load of the wheel on the track are alone considered.

(3) Bouncing and track damage become less as the hammer blow diminishes. No appreciable wheel lift occurred with 30 per cent. balance.

(4) The limiting factor in reduction in hammer blow so far as these tests are concerned is the fact that undue oscillations were observed on the engine with 30 per cent. balance.

(5) The condition of the track has little effect on the incidence or extent of wheel lift, which depends primarily on the hammer blow.

After these tests the proportion of balance on this class of engine was standardised at 50 per cent., instead of 66.6 per cent.

The foregoing sections of the paper indicate the steps already taken towards reducing hammer blow, and set out some good reasons why it should be reduced to as low an amount as possible, even if it cannot be eliminated.

That this has not been done already is due to the fact, clearly demonstrated by theory, that the engine itself must be correspondingly subject to horizontal disturbing forces which—especially in the case of two-cylinder engines—may reach considerable size. The effect of these horizontal forces on the locomotive is, however, unlike the hammer blow effect, very ill-defined. Neither recorded theory nor experiment has so far analysed clearly the resulting oscillations, showing on the one hand how they vary in relation to engine weight, length, and weight of unbalanced reciprocating parts,

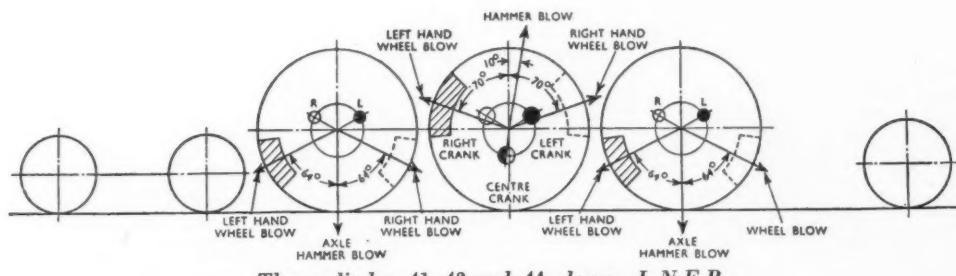
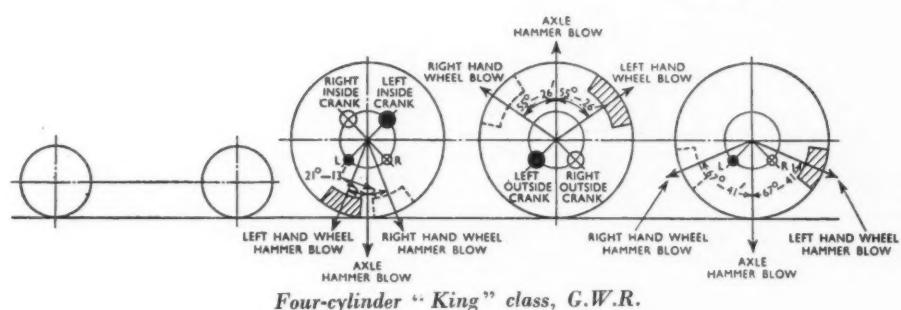
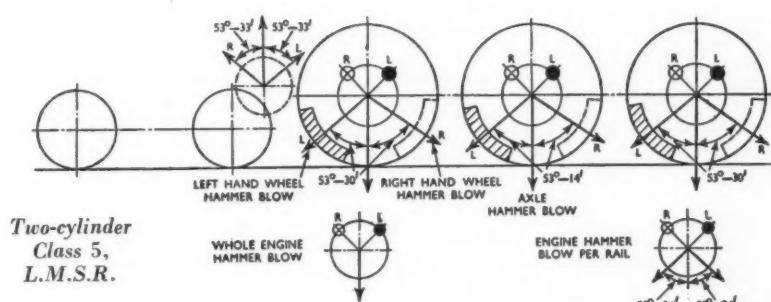
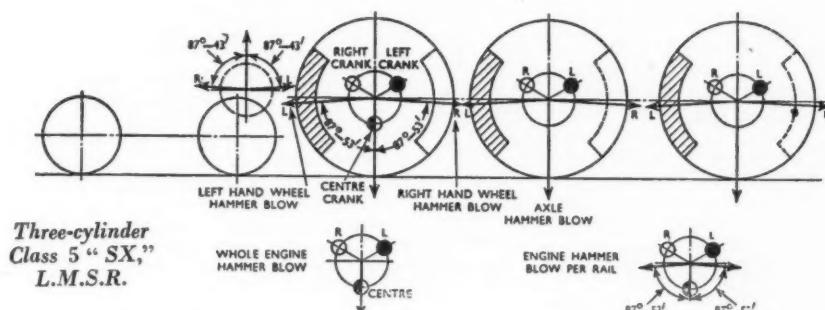
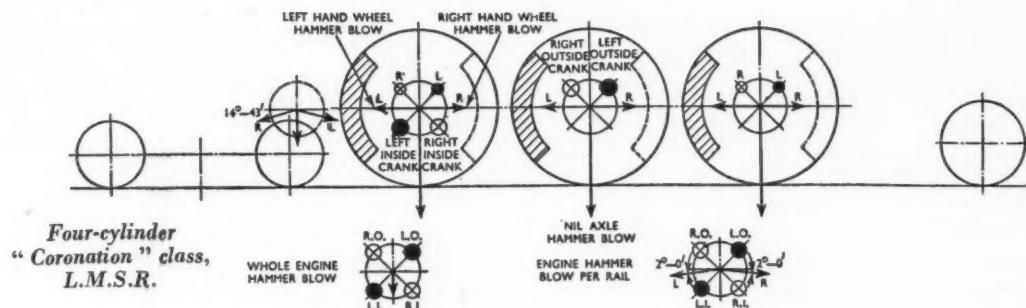
**TYPICAL HAMMER BLOW DIAGRAMS**

TABLE II—RESULTS OF WHEEL-LIFTING TESTS

Engine No.	5043	5464	5406
Percentage of reciprocating parts balanced	66·6	50	30
Slipping speed, m.p.h.	103	104	99
Maximum lift of driving wheel, inches	2·4	0·4	
Engine oscillations	Nothing abnormal	Moderate oscillations	No appreciable lift Excessive oscillations
Hammer blow :-			
Per wheel (leading, driving, and trailing), tons	5 r.p.s. = 103 m.p.h. = 8 r.p.s.	5 r.p.s. = 104 m.p.h. = 8 r.p.s.	5 r.p.s. = 99 m.p.h. = 7·7 r.p.s.
Per axle (leading, driving, and trailing), tons	3·84 4·28	2·95 3·50	1·76 2·10
Total engine blow per rail, tons	10·36	26·60	4·04
Whole engine blow, tons	11·52	29·55	9·60
	9·03	23·10	11·48

and on the other hand what proportion they form of the total locomotive oscillations from all causes. Such being the case, the tendency has been to "play for safety," and in most cases to continue to balance a substantial portion of the reciprocating parts.

Effect on the Locomotive

A locomotive running on the track is subject to some ten separate kinds of disturbance. Two of these are relevant to the subject of the paper : (1) a lateral oscillation or nosing motion, and (2) a fore-and-aft or shuttling motion, both due to the effect of unbalanced reciprocating parts. The remainder of the ten have been very comprehensively dealt with elsewhere.*

In a consideration of the effect on the locomotive, as distinct from effect on the track, the author then dealt theoretically with the nosing couple and longitudinal forces.

It was shown that, while the disturbing force due to the nosing couple increases as the square of the speed, so also does the resistance of the mass of the engine to displacement, the effect of speed thus being nullified. Disturbances greater than the amount of axlebox clearances are likely to occur only with locomotive proportions obtaining in the early days of railways, and not at all with those obtaining on any modern engines, even with nil reciprocating balance. In so far as lateral nosing movement alone is concerned, therefore, there appears to be no necessity to introduce reciprocating balance on any modern engines ; but the situation is otherwise when the longitudinal disturbing forces are studied. These, applied through the axleboxes and frames of a locomotive, appearing at the drawhook as available tractive effort, are made up of two components. First, there is the effect of the steam pressure in the cylinders, the tractive effort exerted thereby varying above and below a mean value, due to the change in steam pressure during the travel of the piston, and to the effective length of the crank. The second is due to the effect of the unbalanced reciprocating parts. The resultant effect depends upon the number of cylinders and the crank angles between them. On ordinary 3- and 4-cylinder engines there is no variation of tractive effort at the drawbar. The author then investigates the conditions with 2-cylinder engines in which the forces in question do not balance, and quotes a formula which has been worked out by the L.M.S.R. to give the value of maximum variation in drawbar pull due to the effect of the unbalanced forces in relation to engine and train weights.

Scientific investigation into horizontal disturbances in locomotives apart from those arising from its function as a vehicle on the track, has not yet been undertaken on British railways. Three methods have been available for this purpose, none of scientific exactitude : (1) riding on the footplate ; (2) studying dynamometer records of drawbar pull ; and (3) examining cinematograph films of engines in motion.

(i) The first method, while very imperfect, enables any marked departure from normal vibration to be distinguished. The following experiences by this method may be cited :—

(i) When an L.M.S.R. 4-4-0 engine weighing 55 tons was converted to have nil reciprocating balance, fore-and-aft vibrations were experienced sufficient to cause discomfort on the footplate, and bring the coal down off the tender. The engine was returned to normal 66·6 per cent. balance after six months.

(ii) An L.M.S.R. 2-cylinder 2-6-4 tank engine weighing 86 tons and having 677 lb. of reciprocating parts per cylinder has been running for eight years without any reciprocating balance. No adverse report has ever been made on its riding.

(iii) The author, in travelling in India on the footplate of a 4-6-2 engine of 90 tons weight, having the whole of its reciprocating parts

(weighing 855 lb. per cylinder) unbalanced, experienced a definite fore-and-aft vibration at about 10 m.p.h. quite unlike any vibration encountered on other similar engines normally balanced. At higher speeds this effect died away.

(iv) The Southern Railway 3-cylinder "Schools" class 4-4-0 type was originally built with only 30 per cent. balance. In May, 1939, one of these engines was altered experimentally to zero balance. No difference in the riding of this engine has been reported. Based on this experience, reciprocating balance has been omitted from the new 3-cylinder "Merchant Navy" class.

This tends to confirm the theory that reciprocating balance is not required on 3-cylinder engines.

(2) Judgment on the basis of dynamometer car records is much more exact, but is also imperfect in that the amplitudes of drawbar variations recorded thereon are also affected by other influences such as the riding qualities of the engine and tender, condition of track, and incidence of brake applications.

Mechanical Effects

Although unbalanced reciprocating parts can give rise to forces of considerable magnitude on axleboxes, guides, and frames, there is little evidence to show that the total elimination of this balance in a modern engine has very serious effect on these components. Engines in the past have been underbalanced by mistake, and this fact has been brought to light, either by the Bridge Stress Committee's trials or by the introduction of dynamic balancing machines ; but there is no record that an abnormal rate of wear itself indicated that engines were underbalanced. Accurate information on this point is scarce and only two records, given below, are within the author's knowledge.

(a) The L.M.S.R. 2-cylinder 2-6-4 tank engine No. 2408 already referred to, with zero balance, was carefully measured for wear in its coupled wheel bearings after 58,560 miles, in comparison with No. 2407, a sister engine having 66·6 per cent. balance which had run the same mileage in the same district. The average measurements are set out in Table 3 ; they are based on 50,000 miles running, which is the average mileage above which axleboxes require attention on this class :—

TABLE III—WEAR IN UNBALANCED AND BALANCED ENGINES
All measurements are given in inches, and are equated to 50,000 miles' running

Engine No. ...	2408	2407
Reciprocating weight per cylinder (unbalanced), lb. ...	677	226
Fore-and-aft wear in axleboxes (including wear in worn guides) ...	0·035	0·042
End play on journals ...	0·165	0·095
Roll in axleboxes ...	0·026	0·020
Wear in coupling rod bushes ...	0·015	0·013
End play in coupling rods ...	0·012	0·011
Wear in big-end bushes ...	0·012	0·011
End play in big ends ...	0·086	0·070

The wear was greater in the case of engine No. 2408, but was by no means excessive for the mileage run, and not of a value which of itself would cause the engine to be stopped any earlier for repairs. This engine has just been overhauled after 198,000 miles since last general repair, the axleboxes having been overhauled three times intermediately. No abnormal wear has been observed on any occasion.

(b) The Southern Railway "Schools" class 3-cylinder engine, already referred to, with zero reciprocating balance was reported to show no appreciable difference in wear from other engines of the class with 30 per cent. balance, when specially examined at general repair after 81,219 miles.

These two cases are special in that the first engine has a high total weight in relation to the reciprocating weights unbalanced ; and the second, being a 3-cylinder engine, does not demonstrate the worst effects of lack of balance. The question therefore remains open, so far as recording experience in this country goes ; and the cases cited only show that where oscillations are small, increased wear is small. Subject to later verification, it is reasonable to suppose that rate of wear will vary with the amplitude of oscillation ; and where that amplitude exceeds the permissible amount for tolerable riding an undue degree of wear can be expected to develop, which in turn will intensify the effects of the unbalanced force.

Conclusions

(1) The modern locomotive is capable of speeds up to 8 r.p.s. and the resulting hammer blows with the usual percentages of reciprocating balance can attain much higher

* Pacific Locomotive Committee Report (Government of India Press, New Delhi), 1939.

values than were visualised in the Bridge Stress Committee's report in 1928.

(2) The phenomenon of wheel bouncing at high rotational speeds was first observed in America in 1937, and tests have shown that it can occur in British practice in certain circumstances.

(3) Conclusions (1) and (2) suggest a reconsideration of locomotive design in the direction of reducing hammer blow still further.

(4) As regards the effect on the locomotive, longitudinal and nosing oscillations depend on the weight and length of engine, weight of reciprocating parts unbalanced, and characteristics of the drawbar springs. They are independent of speed.

(5) Theory suggests that 3- and 4-cylinder engines which are already in a state of balance with regard to longitudinal forces, do not require any portion of their reciprocating parts to be individually balanced to deal with the nosing couple, because of the small magnitude of the displacement. Three-cylinder engines with zero reciprocating balance are already running in this country.

(6) In 2-cylinder engines, theory—supported by a certain amount of practical evidence—indicates that some degree of reciprocating balance is still required if undue longitudinal oscillations are to be avoided. The percentage required will

vary with the engine characteristics, and a method has been suggested for arriving at the amount. Not less than 40 per cent. balance appears to be required on the heavier type of British 2-cylinder engine weighing from 65 to 75 tons.

(7) For the highest speeds, therefore, multicylinder engines are the most desirable, if they are of the reciprocating type. If it is thought necessary to balance a percentage of the reciprocating parts, the 4-cylinder is preferable to the 3-cylinder type, from the point of view of hammer blow. If this balance is eliminated, there appears to be little to choose between the two types.

(8) The final criterion as to what percentage of balancing is necessary is the magnitude of the oscillations which can be admitted on the engine, having regard to riding comfort for engine crew and passengers, wear and tear, maintenance costs, and safety.

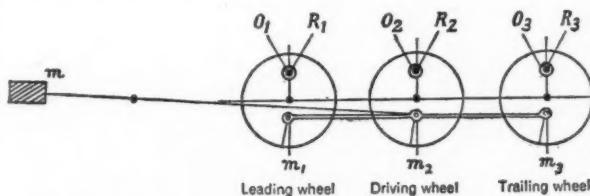
(9) Practical experience so far recorded tends to support the theoretical conclusions. It is, however, very scanty, and when normal conditions return, scientific investigation will be required, not only to establish the precise effects of the unbalanced parts on the locomotive, but also to define the limiting value of the disturbances which can be admitted. More experimental verification is needed as a prelude to any large-scale reduction in hammer blow.

CAN HAMMER-BLOW BE ABOLISHED ?

Summary of a paper by Sir Harold N. Colam, B.A., M.Inst.C.E., and Major J. D. Watson, R.E., B.Sc.(Eng.), A.M.Inst.C.E., entitled "Hammer-Blow in Locomotives: Can it be Abolished Altogether?" presented on December 16 to a joint meeting of the Institutions of Civil and Mechanical Engineers

THE paper deals with outside-cylinder locomotives only. The diagram reproduced illustrates the meaning of hammer-blow; the masses required to balance the rotating and reciprocating (or oscillating) parts are referred to as R and O respectively. The rotating parts are supposed to be completely balanced, and it is the vertical components of the additional masses (or overbalances), O , which give rise to hammer-blow when they rotate at "anything up to 7 r.p.s."

Evidence in support of the contention that in modern locomotives overbalance is unnecessary has been accumulated since 1926. The first step was to determine the values



M = Mass of piston, piston rod, crosshead, and part of connecting rod

of R and O in existing locomotives. Some surprising results were obtained. With metre-gauge locomotives, it was found that the overbalance ranged from +51 per cent. to -15 per cent. In other words, in many locomotives, not only was O non-existent, but also R_1 , R_2 , and R_3 [*i.e.* R for all coupled wheels of a 6-coupled locomotive] together were not sufficient to balance the rotating masses. The worst figure, -15 per cent., was found in fast-running 4-6-0 passenger locomotives of the Madras & Southern Mahratta Railway, which had given eminently satisfactory service for many years. No-one, drivers, foremen, or those responsible for upkeep, had any complaints to make against them. These

discoveries gave rise to the contention that overbalance was either entirely unnecessary, or at least could be much smaller than was generally considered necessary. Standard locomotives were then being designed, and have since been put into service, with overbalance of 66 per cent.

Almost more startling was the discovery that in every one of the large number of locomotives examined, the counterweight on the main driving-wheels, $R_2 + O_2$, was inadequate to balance the rotating masses on that wheel. The result was a heavy hammer-blow under the crank-pin; usually hammer-blow is on the opposite side of the wheel. Actually, the -15 per cent. case was not the fault of the designers or manufacturers. At some date after delivery, the method of attaching the tyres had been altered, and in the process the outermost and most effective part of the counterweight had been machined off, without consideration of the consequences. Similar investigation in broad-gauge locomotives revealed overbalances ranging from 80 per cent. to 13 per cent., but, at that time, no negative overbalances. Failure to balance the rotating masses on the main driving-wheels was, however, found in many cases.

A parallel investigation* on the South Indian Railway showed similar results. In one 4-6-0 type passenger locomotive, in no wheel were the rotating masses balanced, and there was a total underbalance of not less than 50 per cent. In other words, far from the reciprocating masses being partly balanced, their weight of 403 lb. was virtually increased to 600 lb.; but there were no evil results. Admittedly speeds did not normally exceed 40 m.p.h. Again, in not one of the three types examined were the rotating masses on the main driving-wheel balanced. These results were published in 1928.

In 1930, one of the authors published a paper† giving some of the facts discovered up to that time. The conclusion reached was that the unbalanced proportion of the recipro-

* Quarterly Technical Bulletin, Indian Railway Board, vol. i, No. 8, January, 1928

† Sir H. N. Colam, "Should the Present Policy of Balancing Two-Thirds of the Reciprocating Masses of the Locomotive be Reconsidered?" Quarterly Technical Bulletin, Indian Railway Board, vol. ii (1929-32), No. 17, p. 11 (April 1930)

cating masses could be increased without effects being any worse than they had been in the past, yet, owing largely to the state of affairs revealed by the Bridge Stress Committee, designers were tending to balance a greater proportion of the reciprocating parts.

Experiments on the Reduction of Overbalance

By 1930, a large number of new standard locomotives was in use in India with 66½ per cent. of the reciprocating masses balanced. Permission was obtained to fit temporary weights on the crank-pin side of the wheel, sufficient to cut down the overbalance to 33 per cent., on three of the major railways in India. The object of the experiment was not divulged, but drivers and maintainers were asked to report in due course whether any difference was noticed in the running or maintenance of the locomotives. The reports, which came in for some years, were entirely negative—except that one driver maintained that his locomotive "started, ran, and stopped better." As a result of the experiment, the decision was taken to cut down the overbalance to 33½ per cent. in these and future locomotives of the same type. This was a step in the right direction, but there was plenty of evidence to suggest that the overbalance might be cut out altogether.

Meanwhile, on the Madras & Southern Mahratta Railway experimental work had been proceeding cautiously. In May, 1932, two "YC" class (heavy metre-gauge passenger) locomotives were rebalanced taking into account 20 per cent. of the reciprocating parts. Trials were also made with "W" class broad-gauge locomotives with no reciprocating parts balanced. In June, 1935, the Chief Mechanical Engineer of the railway reported that "W" class engine No. 776, which had been rebalanced for 20 per cent. reciprocating parts, had run 40,000 miles, and that wear on axleboxes and side-rod bushes was perfectly normal. "W" class engine No. 773, which had been rebalanced with no reciprocating parts balanced, had been running for 4 months and was reported to ride perfectly satisfactorily. This type of locomotive came to be known as the "RO" type; and in this paper "RO" indicates an engine with no reciprocating parts balanced.

By that time sufficient data were at hand to enable the Chief Mechanical Engineer to conclude that there was no apparent reason why the proportion of reciprocating parts balanced should not be reduced to a maximum of 20 per cent. There were also indications that it might be possible to cut out all the reciprocating balance, and he was prepared to continue the experiments on these lines, particularly in the case of the metre-gauge engines, in which the existing state of balance was in many cases very unsatisfactory.

Comparative Trials of Locomotives with Balanced and Unbalanced Reciprocating Parts

In September, 1935, the junior author took part in a trial of an "XB" class locomotive. The first run was made with the engine unmodified, and the second run, on the same day, with the engine fitted with temporary counterbalance weights calculated to reduce the amount of the reciprocating parts balanced to zero. Hallade track-records were made during both runs. Speeds of 76 and 79 m.p.h. were attained on the two runs. Unfortunately the engine selected for these tests had run 50,000 miles since the last heavy repair, and the side-rods, big-ends, and little-ends were knocking badly. It was considered that too many extraneous factors had affected this trial for any definite conclusion to be drawn, and at a later stage it was found possible to repeat the trial with a large number of "XB" class locomotives, including five of the "XB/RO" class. Tests were also made with "YC" class metre-gauge locomotives.

After the Bihta disaster of 1938, in which an "XB," Pacific type engine was involved, the M. & S.M.R. tested twenty-one similar locomotives, five of which were "RO" engines. The latter, and a similar number of "non-RO" engines which had run approximately the same mileages, were grouped in pairs, and gave Hallade records closely resembling one another. The authors have come to the conclusion that what little there was to choose between the

two engines of each pair cannot be attributed to their state of balance. In none of the runs selected was the running so rough as to result in any comment from the officer on special duty who accompanied the trials. In the course of 21 runs, three cases of severe oscillation did occur, but in no case was an "RO" engine involved. It may be added, however, that those three engines had done between 80,000 and 110,000 miles, whilst no "RO" engine had done more than 69,000 miles since the last heavy repair.

In April, 1939, a further series of tests was made on "YC" metre-gauge locomotives, three of which were of the "RO" type. The Hallade charts for this series of tests show that the sideways oscillation in the case of the "RO" locomotives is distinctly less than that recorded for the normally-balanced locomotives. In other respects, the diagrams for a pair of locomotives that had covered approximately equal mileages since overhaul, show little divergence.

Shortly after the trial run in September, 1935, "XB" locomotive No. 202, which had been rebalanced for no reciprocating parts, had completed 55,000 miles on ordinary passenger-train service, and came into the shops for light repairs. The riding of this locomotive was reported to differ in no noticeable manner from other "XBs" with orthodox balancing, and no defects had developed. The Chief Mechanical Engineer reported that, as regards the condition of the side-rod bushes and draw-gear, there was no difference in the wear beyond those variations met with in ordinary practice, and that, if anything, the condition of the axleboxes of "XB" No. 202 was slightly better than was normally found. As a result of this report, it was decided to rebalance six more "XB" engines and six more "W" class engines, eliminating all overbalance.

A common criticism of the policy of balancing locomotives without overbalance is that the wear in the horn-cheeks and axleboxes will be excessive, but the authors show that the horizontal force on the horn-cheeks, instead of being excessive, is actually smaller and more even for an "RO" engine than for an ordinary engine. The vertical force on the rails for an "RO" engine is practically constant, and the torque is considerably less variable than for the ordinary type.

On the M. & S.M.R. a large number of different types of locomotives was rebalanced for no reciprocating parts in 1936. These included the "M," "P," "G," and "YC" classes.

The Effect on Bridges of Ordinary and "RO" Locomotives

In February, 1937, the Bridge Standards Committee of India suggested experiments to compare the impact effects on bridges of various lengths of span due to: (1) a normally-balanced locomotive; (2) an "RO" locomotive; stating that, if hammer-blow could be eliminated, as well as rail-joints on bridges, two of the main causes of impact would disappear, and there would be a good case for revision of the impact formula. The experiments were carried out in 1938, with a special test train consisting of an "XB/RO" locomotive coupled by empty bogie passenger-coaches to an "XB" locomotive, with 66 per cent. reciprocating balance, equally distributed between the six coupled wheels. After preliminary trials records were obtained by a deflectometer, and were supported by extensometer results where these were considered to be reliable. As wide a range of spans was used as was possible, namely, from 12 ft. to 131 ft., taking into consideration the fact that it was feasible only to carry out tests on the north-west line of the M. & S.M.R., where "XBs" are in regular use and sufficient time is available between trains to carry out tests. The test train consisted of one empty third-class bogie-coach coupled between engine No. 212, "XB/1/RO," and engine No. 213, "XB/1," except for the 131-ft. span bridge. On this bridge, two third-class bogies were coupled between the engines, and engine No. 214, "XB/1/RO," was used instead of No. 212.

Deflections and stresses were first measured at the crawl while the train was backing at about 3 m.p.h., and again as nearly as possible at 60 m.p.h., at which speed several runs were made. In the case of the 131-ft.-span bridge, lower speeds were also run to try to obtain resonance, which was

calculated to be at 3.77 r.p.s., corresponding to 49 m.p.h. This was deduced from the formula

$$n_0 = \sqrt{\frac{1}{w + p} \cdot d}$$

In the shorter spans, the deflections were so small that impacts can be regarded as only roughly approximate. In the larger spans—64 ft. and 131 ft.—there was, in both the deflection and the stress records, a very marked resonance effect under the "XB/1" engines, which was not noticeable under the "XB/1/RO" engine. Actual resonance was not attained in either bridge, because in the 64-ft. span 80 m.p.h. was a speed too high to attain, whilst in the 131-ft. span, unfortunately, no runs were made at 49 m.p.h., the calculated critical speed. The difference was, however, sufficiently striking to show the relief afforded to bridges by rebalancing for no reciprocating parts.

These results were considered by the Bridge Standards Committee at its nineteenth meeting, held in Delhi in January, 1939. The committee recommended that, when considering stress imposed by locomotives with no reciprocating parts balanced, on existing bridges, impact should be taken as 80 per cent. of the usual allowance.

Conclusion

The authors' conclusion is as follows:—

It is perhaps advisable to discount in advance the effect of certain remarks made by the Pacific Locomotive Committee sent to India in 1938 to investigate defects in the Pacific type locomotives. This committee visited the M. & S.M.R. and recorded its opinion of two "RO" engines as follows: "Reciprocating weights had been unbalanced and there was, as a result, fore-and-aft vibration" and "owing to the absence of balance of reciprocating parts it was very rough and there was much vibration with short-period nosing and shuttling." If there is one thing certain about a locomotive, it is that it is exceedingly difficult to isolate the effect of one feature of the engine, because there are so many effects which may mask or modify it. This is doubly or trebly

true when experience is limited to one comparatively short run on the locomotive. The authors are therefore frankly surprised that the committee sponsored on such limited experience the statement that rough riding in those cases was due to lack of overbalance, especially in view of an opinion recorded later in the report in regard to certain modifications made in "XB" locomotives, that "their effect could be evaluated in no better way than by personal impression gained when riding on the footplate on various occasions, without regard to time or place, and this can be very misleading." Against these two adverse criticisms, based in the opinion of the authors on wholly inadequate experience, there is the fact that 75 "RO" locomotives are in daily use on the M. & S.M.R. No trouble has been experienced which can be connected in any way with the lack of overbalance, and the Chief Mechanical Engineer is satisfied that no difference can be detected between these engines and engines normally balanced, either in wear-and-tear or in behaviour on the road. It is admitted that the experience has been gained with outside-cylinder locomotives at what some railways may consider comparatively low speeds. There is nothing to show, however, that the results would have been different had higher speeds and other types of locomotives been under consideration.

A good deal has been written and said about locomotive balancing in recent years, and it might be contended that the subject may now be allowed to drop. The authors, however, are of the opinion that this is a mistaken view, and that the subject is of increasing importance. There has been a widespread move to increase railway speeds in most countries and there are already indications that this will introduce new troubles. In America it has been discovered that, with certain locomotives at very high speeds, the main driving-wheel actually lifts clear of the rail at one point in its revolution. Apart from any risk of derailment entailed, this must increase rail and bridge stresses to dangerously near to, or even beyond, the safe limit. The authors' view is, therefore, that a *prima facie* case for abolishing overbalance has been established, and that if locomotive engineers wish to continue this practice, they must prove that it is necessary. It is certainly expensive.

The paper is accompanied by a number of diagrams, four tables, and two appendices.

CO-OPERATIVE TRAIN SERVICE ECONOMIES IN THE U.S.A.— Last winter a communal railway enterprise of considerable interest was inaugurated in the United States. As described on p. 658 of our December 27, 1940, issue, ten railways combined to provide high-speed service between Chicago and the Floridian coast resorts, in such a way that three trains, using three different routes, turn-and-turn about, offered between them a daily streamliner from Chicago to Miami, and vice versa, with exactly the same departure and arrival times irrespective of route. Access to Florida was obtained over Atlantic Coast and Florida East Coast lines; the Pennsylvania's South Wind used the Louisville & Nashville Railroad as the connecting link; the Illinois Central's City of Miami went south by way of the Central of Georgia; and the Dixie Flagler of the Florida East Coast went north to Chicago over the Atlanta, Birmingham & Coast, Nashville, Chattanooga & St. Louis, Louisville & Nashville, and Chicago & Eastern Illinois systems. The same co-operative principle is being used this winter, but, in order to release 43 cars for national defence purposes, the schedules have been recast, as we recorded at page 512 of our November 14 issue. Certain trains will be worked every third day, instead of daily; there will be four daily departures from Chicago; and extensive ticket availability will apply. From December 17 a daily sleeping and chair car train will leave Chicago at 9 a.m. by each of the three routes in turn, taking 31 hr. 59 min. southbound and returning at 11.40 a.m. on a 32 hr. 25 min. schedule. The three all-coach streamliners will leave Chicago at 9.40 a.m., and Miami at 6.25 p.m., continuing their existing 29½ hr. schedule, again turn-and-turn about, but in such a way that the daily 9 and 9.40 a.m. departures from Chicago and Miami are by different routes on different days. Additional and slightly slower services will

operate from Chicago at 11.25 p.m. for the west coast Florida resorts, and at 8 p.m. (from January 1) for Miami, again using the three routes alternately.

UNDERGROUND PARKING PLACES IN BUENOS AIRES.— Three years ago the first two municipal underground parking places of a programme contemplating a total of eight of such traffic facilities were placed in service in Buenos Aires. These two have a capacity for 756 motorcars and have proved of considerable assistance in relieving traffic congestion. Moreover, they have paid their own way, as the small parking fee of about 8d., plus rents from sales rooms and repair shops, and poster advertising, have provided sufficient revenue to meet operating costs and interest charges. Their assistance in relieving traffic congestion has been so satisfactory that it is hoped that the entire programme, providing accommodation for 6,770 motorcars will now be completed. The two existing underground parking garages were built in connection with road widenings for which strips of old buildings one block wide and five blocks long were removed. Buenos Aires is peculiar inasmuch as the greatest traffic congestion is on the rim of the city rather than near the centre. Underground railway lines radiate in three directions from this commercial area on the rim of the city and the remainder of the underground parking facilities are to be provided adjacent to these underground railways. The two existing parking garages are each 200 ft. wide; one is 800 ft. long and the other 400 ft. Access is provided by ramps on each side. The garage structures are of reinforced concrete and the ceiling height of the garages is 15 ft. Mechanical ventilation systems are provided.

THE FUEL PROBLEM IN ARGENTINA

The latest fuel rationing regulations and the diesel fuel position on the railways

THE fuel shortage in Argentina has reached a stage which is causing grave anxiety to the Government, the railways and private industry, the existing stocks having fallen to alarmingly low levels. On August 31 last the stock of coal in the country amounted to 897,248 tons, as compared with 1,020,906 tons on May 31; and the reserves of petroleum and by-products had declined during the same period from 1,208,176 tons to 1,054,798 tons. Specially serious is the reduction in the stock of fuel oil, an enormous quantity of which is consumed in the country and the demand for which is steadily rising, owing to the development of motor transport.

Government Control and Fuel Rationing

In view of the seriousness of the situation, the Government issued a Decree on October 18 establishing that, for the duration of the present international emergency, the fuel stocks are to be placed under the control of the Ministry of Marine, which is authorised to take the necessary steps to maintain a sufficiency of such stocks. As a result of this arrangement, the National Fuel Commission, appointed in 1940 to control and supervise the distribution of the country's reserves, has been dissolved. By virtue of the authority vested in it by the Government, the Ministry of Marine has ordered a fuel rationing scheme to come into force immediately, the main regulations of which are as follows :—

(1) *Railways*.—Coal consumption by the railways is reduced to 70 per cent. and heavy oil fuel to 85 per cent. of the 1940 total; also the consumption of petrol must not exceed that registered in 1938. The quotas for each railway will be fixed by the Ministry of Public Works in accordance with its requirements. The number of electric trains is to be reduced in the less busy hours.

(2) *Electric Power Plants*.—Coal and petroleum consumption by these entities during the next 12 months is limited to 85 per cent. of that for 1940.

(3) *Manufacturing and Gas Companies*.—No imported fuel of any kind will be delivered to these concerns except when absolutely essential and then only up to 75 per cent. of that consumed in 1940. Petroleum companies will be urged to increase fuel oil production. No diesel oil will be delivered to be burnt in boilers.

(4) *Foreign steamers* are required to carry sufficient fuel for the return voyage, or build up stocks locally.

(5) *Argentine tankers* must not be used for the transport of grain or other dry cargo, and their conversion for such purpose by shippers is forbidden.

(6) The use of imported coal for domestic purposes is strictly prohibited.

(7) Fuel consumption by Government departments is reduced to 50 per cent. except by the National Roads Board (for asphalt purposes), public sanitary works and the State oilfields.

The Position of the Railways

As most of the Argentine railways, more particularly those operating diesel traction, had entered into contracts, either locally or abroad, before the war, for the supply of oil fuel, their position with respect to this class of combustible is, generally speaking, much better than as to coal, and all the companies are stated to have on hand ample stocks of petroleum to ensure the efficient operation of their services for some months at least. Of the total of 6,822,000 tons of petroleum consumed in Argentina during 1940, about 1,601,000 tons, or roughly 25 per cent., pertained to the railways.

One of the measures urged upon the Government for the conservation of the national fuel supplies is that the railways, especially the State-owned lines, should be obliged to convert their oil-burning locomotives into charcoal and firewood consuming units, particularly on the lines serving the timber-producing zones of the Republic. In this connection it is pointed out that the policy followed by the State railways of converting their locomotives into oil-burning units had tended to aggravate the petroleum shortage; the consumption of oil fuel by the State-owned lines has increased from 157,000 tons in 1938 to 200,000 tons in 1939, and to no less than 273,000 tons in 1940.

Despite the great increase in the national production of petroleum, Argentina is not yet entirely self-supporting in this respect, as the quantity produced a year by the national oilfields represents only about 50 per cent. of the country's requirements, the balance being imported. According to

the official statistics, the total value of fuel and lubricants imported into Argentina during the first six months of the current year was \$70,055,539. This compares with \$93,001,661 for the corresponding period of 1940, and \$116,578,234 for the first, or pre-war, half of 1939. Quantitatively, these imports declined during 1940 by 20·5 per cent., as compared with 1939, and the first half of the current year showed a further drop of 32·2 per cent. as compared with 1940.

One of the difficulties in the way of obtaining adequate oil fuel supplies from abroad has hitherto been the scarcity of tankers, but it is stated that the Argentine Government is negotiating for the purchase of a fleet of tankers for the transportation of petroleum from overseas.

National Oil-Producing Zones

Argentina's principal oilfields are those at Comodoro Rivadavia in the southern territory of Chubut, and those in the Northern Provinces of Salta and Jujuy, both of which regions are served by the State railways. The hopes which had been entertained of the potential productivity of the Mendoza oilfields have not so far been realised, as although the monthly output for the first seven months of the current year is appreciably higher than that recorded during the corresponding period of 1940, the production figures are still much below what had been expected, the productive capacity of the Mendoza oilfields being originally estimated at upwards of 600,000 tons per annum.

The Railways' Diesel Fuel Position

In the light of this present fuel situation in Argentina, the following notes—made immediately before the publication of the Decree of October 18—upon the position of the various railways in regard to diesel traction and fuel, are pertinent. In view of the new regulations it is possible that the fuel situation on the railways may have to be considerably modified. If, however, the Government obtains the tankers, as hoped, the oil fuel position should be eased.

On the B.A.G.S. and B.A.W. Railways there are at the moment in daily service the following 86 diesel units :—

4 diesel-electric trains (mobile power houses) on local services.

70 railcars.

3 diesel-electric locomotives for main line trains.

9 diesel-mechanical shunters.

The present monthly consumption of fuel oil averages 500 tons. The companies had a contract with the Shell-Mex concern in Venezuela before the war, and up to the present have experienced no difficulty in obtaining adequate supplies, despite the increased cost of this class of fuel.

On the B.A.P.R. no immediate difficulties are expected in obtaining a sufficiency of diesel fuel, of which the company had ample stocks available. In this respect, the railway is much better situated than as regards coal, the restricted importation of which was a serious problem.

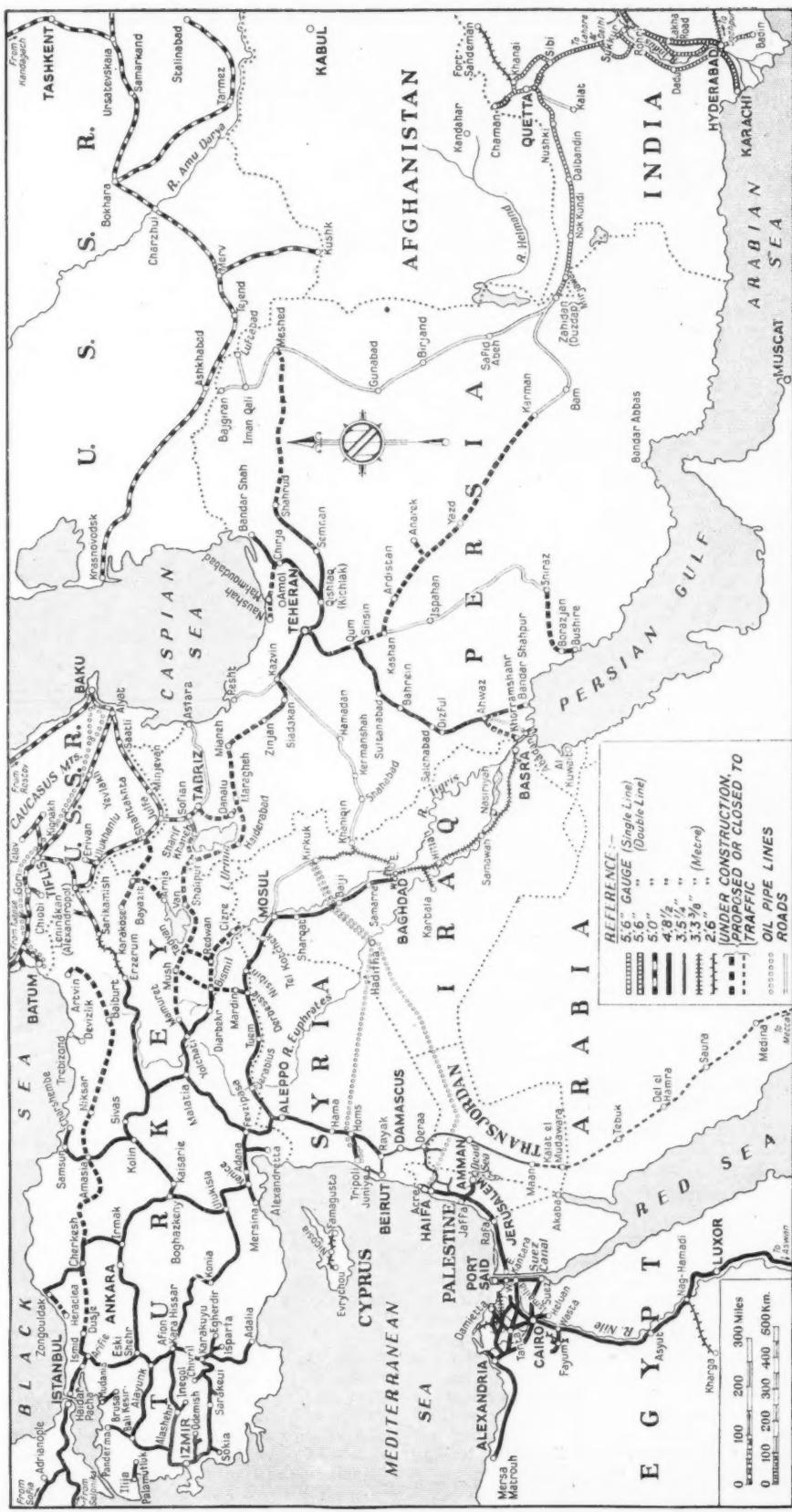
The C.A.R. does not expect, at any rate for the present, any difficulty in regard to diesel fuel supplies.

The Entre Ríos and Argentine North Eastern administration writes as follows : "Up to date, our diesel services have not been affected by the fuel situation, and although, of course, future prospects in this connection are by no means certain, we have some reason to believe that supplies will be maintained, at any rate for the time being. In view of this, and as we possess an adequate reserve stock, the question of fuel for the diesel units is not a matter of preoccupation at present."

"All the original services are being maintained, and there are indications that our stud of diesel coaches could be increased to advantage. However, under present world conditions, there is little likelihood of acquiring further units, although it may be possible by more intensive employment of the present stud to explore the development of additional services and obtain indications as to the most suitable type of coach for our conditions."

No information is yet available as to the position of the State railways.

The Railways of the Near East



Recent Allied activities have resulted in placing a continuous band of territory, with important lines of communication, under British and Russian control. This front extends from the Western Desert (on the borders of Libya and Egypt) to the Caucasus Mountains and Caspian Sea, and to North-West India. Turkey and Afghanistan remain neutral. Egypt, Palestine, Transjordan, Syria, Iraq, Persia, the U.S.S.R., and India, are in Anglo-Russian Allied hands, or under such military control

THE JUNCTION INTERLOCKING PROBLEM

The double crossover junction has given rise to much discussion among designers of interlocking, and special locking arrangements have been proposed in order to obtain maximum safety combined with freedom and rapidity of working.

THE accident at Slough, G.W.R., on July 2, 1941,* has again directed attention to the problem of the double crossover junction. This problem has often been discussed among those responsible for arranging the locking in signal boxes, which the signal engineer always tries to design so that as much protection as possible is provided against the consequences of errors of judgment. While all our working arrangements must rest on the assumption that adverse signals will be respected and instructions observed, all reasonable precautions that will not hamper legitimate operations must be taken against lapses on the part of trainmen or signalmen. In some cases the endeavour to do so resolves itself into a choice between two evils, especially as the danger is not a fixed element in any given case, but necessarily changes as the positions of two or more trains alter with respect to one another, and is affected by their speed, weight, brake equipment and other variable factors.

At an ordinary junction on a double line the rule that the points inside the curve must be set for the branch line before those on its outside can be similarly positioned has long been followed, the danger from a mistake being greater at a left hand junction, as in that case it is a running movement which can come foul of the branch route at the crossing; but gradients and other factors can sometimes lead to the risk being appreciable at a right hand junction. At a crossover junction the left hand layout is again the more dangerous, for the same reason. Different arrangements have been proposed and are in use, either with all points worked by separate levers, or some coupled together. If the points at each end of one crossover are coupled to one lever, so that only two point levers are used, the setting of a crossover route, if over-running movements are to be deflected, causes the outside straight movements to be needlessly interfered with by the trailing points. This arrangement cannot have the usual junction locking added, therefore, as it would be too restrictive. If four levers are used, or three by coupling the two facing points to one lever, over-running deflection can be secured, and the trailing points can still be used as required. By using four levers, all free of one another, the working is left to the signalman's judgment, and this, combined with clear block telegraph instructions, is thought

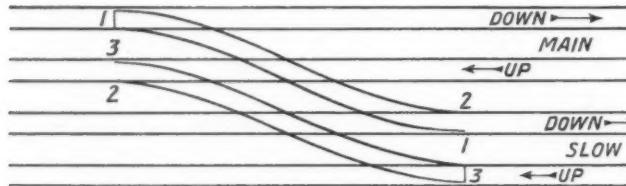


Fig. 1—Wide-to-gauge points at double junction (points 3-2 and 1-2 wide to gauge if lever 2 only moved)

by some to be the preferable method. Practice is not uniform everywhere, however, and occasionally local conditions of gradient and other factors, which may increase the probability of runaways, influence the choice of working.

An arrangement now used at some right hand cross over junctions consists in having the tongues of the trailing points individually worked, as shown in Fig. 1, only one of them being coupled to the lever working the corresponding facing points, the other, in common with the companion tongue of the other pair of trailing points, being coupled to a third lever. In running from down main to down slow, for example, levers 1 and 2 are reversed and the other trailing

* Ministry of War Transport Report summarised in THE RAILWAY GAZETTE OF November 28, 1941, page 567

points 3/2 become wide to gauge as a safeguard against setting back movements. Such an arrangement is not practicable of course for facing points in running lines and cannot be added to the critical key points of a left-handed crossover junction.

Another arrangement favoured for both left and right handed crossover junctions is to make the signal controlling the straight movement on an outer line lock the points on the further of the two inner lines normal, unless those adjacent to them on the other outer line are reversed, and this would seem to be a simple and effective plan, affording as much safety as ordinary interlocking can be expected to do.

Dutton's Junction Interlocking

As the result of a serious accident at a crossover junction, when a signalman forgot to restore one pair of points to normal and a propelled movement was turned foul of an express, Mr. S. T. Dutton, Signal Engineer of the East Indian Railway from 1899 to 1921, proposed a system of special interlocking. Mr. Dutton's proposals were based on the principle of compelling a signalman to provide isolation for a movement before clearing a signal whenever such isolation was practicable at that moment, but of enabling him to destroy it in an emergency in the shortest possible time. To do this he employed certain locking which was non-

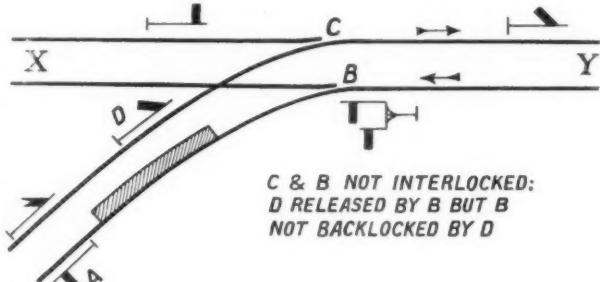
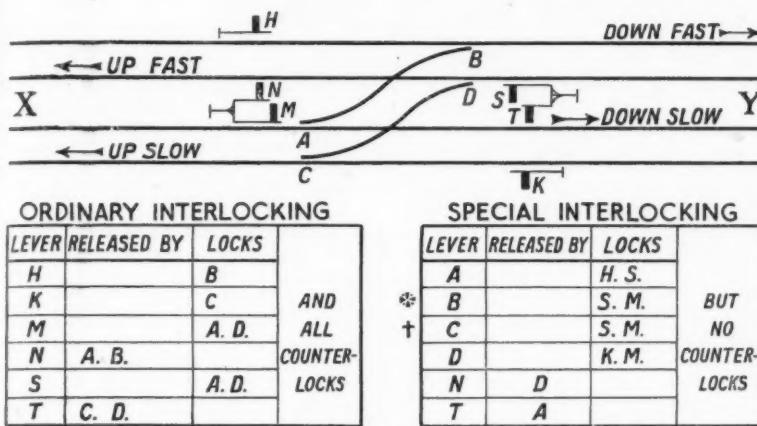


Fig. 2—Dutton's junction interlocking

reciprocal, considering that the difficulties of the problem were needlessly increased by the fact that ordinary tappet locking is automatically reciprocal and any lock between two levers is bound to be rigidly and mutually exclusive. The simplest instance of this is shown in Fig. 2, where a train is standing at signal A and all signals have been cleared for another expected from the branch. With the conventional interlocking, should warning of a runaway be received from Y, points B can only be moved last of all, after all other levers have been restored. With the special interlocking proposed, B and C would not have the customary junction locking between them, but B would have to be pulled in order to clear D, after which it would, however, not be backlocked by D, so enabling it to be moved first in an emergency, instead of last. This principle can naturally be made applicable to other locations.

The Left Hand Crossover

The application of Mr. Dutton's proposals to a left hand crossover junction, the layout involved in the Slough accident, is illustrated in Fig. 3, and examination of the locking tables will show that the signalman is obliged to provide isolation for a given movement before clearing the signal for it to take place, but that although the route controlled by the signal then of course becomes held, the lever of the isolating points, although compulsorily moved before the signal lever,



* NOT NECESSARY UNLESS DOWN FAST TO Y ON LEVEL, OR RISING FROM JUNCTION, OR RUNNING LINE IN STATION YARD

† NOT NECESSARY UNLESS UP SLOW TO X IS SIMILARLY CIRCUMSTANCED
IF THIS SPECIAL LOCKING IS NOT EMPLOYED THEN ORDINARY LOCKING MUST BE PROVIDED BETWEEN M & S AND B & C

Fig. 3—Dutton's special interlocking for crossover junction

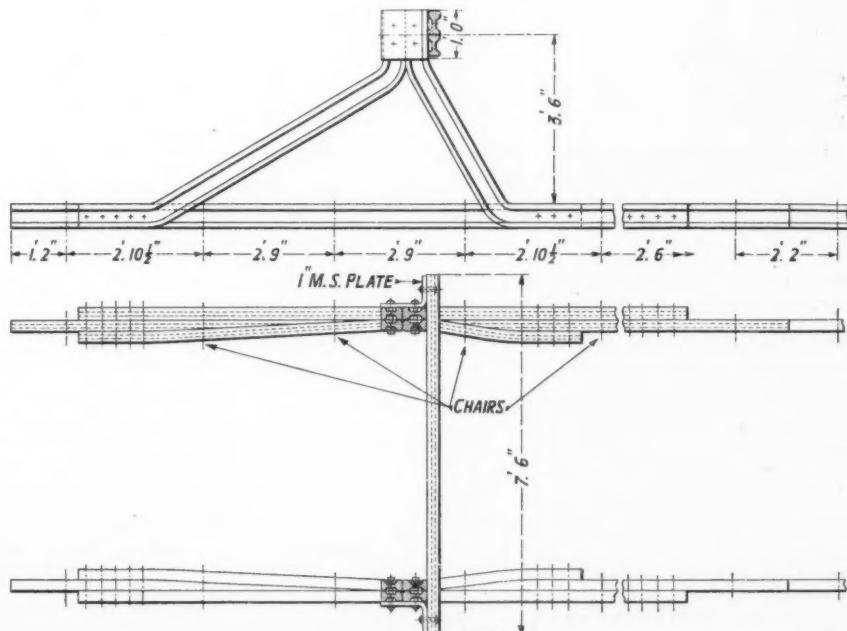
is not locked thereafter, so that the isolation can be interrupted in an emergency by moving that lever at once—half stroke if necessary—before dealing with any others. Thus in the case of the movement made at Slough, when signal T

instrument locking applies Mr. Dutton's principle of non-reciprocal action to that, obliging some lever to be set before working the block but not holding it irrevocably.

L.M.S.R. STANDARD BUFFER STOPS

SIMPLE standard buffer stops, for use in sidings, are now being produced by the L.M.S.R. at the permanent way shops of the Scottish Division for use over the whole system. They are constructed entirely of old rails and steel angles, nuts and bolts, and no timber is used, as will be seen from the drawing.

The buffer stops are made to exact sizes and all parts are interchangeable. Full use is made of labour-saving appliances, for example, all cutting is done by oxy-acetylene flame. Eleven men can turn out twelve sets a week, and over 500 sets were turned out during last year.



Right : Drawings of standard buffer stops for sidings on the L.M.S.R., showing (above) side views and (below) vertical view, in each case with principal dimensions

NEW TESTS ON WELDED BRIDGE GIRDERS

Important German tests to ascertain causes of bridge failures and to indicate future precautions

To ascertain the causes of the failure of the welded Zoo (Berlin) and Rudersdorf bridges¹ a special research committee of the German Structural Steel Association has carried out extensive tests on welded bridge girders. These tests have confirmed that both the composition of the steel and the design of the tension flange of welded girders are of decisive influence. Some notes on those tests may show how to examine a steel qualifying for bridge welding.

During the construction of the first series of welded test girders (see Figs. 1 and 2) those conditions which had proved unfavourable and disastrous at the Zoo and Rüdersdorf bridges were reproduced and even intensified : First the web stiffeners were welded to the webs ; then the ribbed flanges (triangular-boss plates) were clamped against the stiffeners, and the web-flange welds were made ; welding was done with the tension side cooled by applying a mixture of ice and salt on water and an air jet, and no layer was deposited before cooling of the previous one. This welding procedure caused high stresses in the webs and stiffeners ; very high tension stresses in the web-flange welds and considerable distortion were produced, owing to the stiffeners preventing shrinkage of the

deformation before testing and repeating the load 500 times at tensile stresses in the extreme fibre of 19.1, 21.4 and 23.8 tons per sq. in. did not cause fracture.

(3) The calculated stresses at maximum load were 31.7 to 34.1 tons per sq. in.

The tests have proved, therefore, that thanks to the quality of the steel (Steel 52 with a minimum tensile strength of 52 kg. per mm.² or 33 tons per sq. in.) and in spite of the excessively severe conditions imposed on the girders during construction and testing, it was possible to produce welded structures of high resistance.

The maximum hardness in the heat-affected zones of the web-flange welds reached 395 Brinell. In these zones numerous transverse cracks were found, equally distributed over the entire length of the girders, also in the parts less affected by bend testing. The investigation of the girders which had not undergone a load-deflection test showed that the cracks were due solely to welding (Fig. 3). Yet the numerous fine and short cracks did not prevent a large deformation without fracture in the load-deflection tests, even when extreme overloading took place.

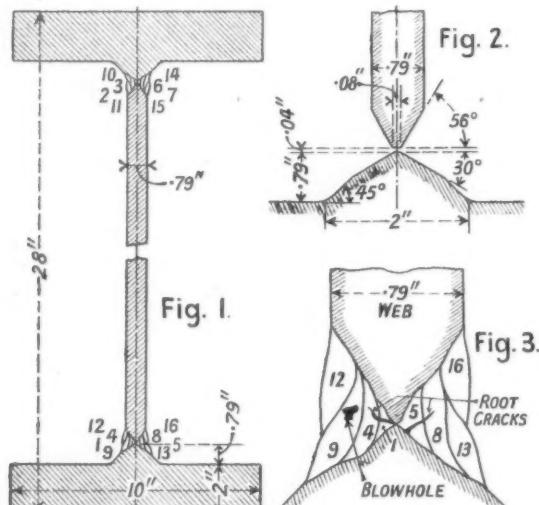


Fig. 1.—Ribbed-flanged girders No. 1 to 6 : Cross section and welding sequence.

Fig. 2—Ditto : Web-flange detail (prepared for welding)
Fig. 3—Ditto : Web-flange weld section

flange plates. By cooling the flanges and welds the welding heat was speedily conducted off, and the heat-affected zones of the welds were considerably hardened.

The load-deflection tests, too, were performed under severe conditions. Tensile stresses were applied in steps, and each stress was repeated up to 500 times. In two girders the tension flanges were cooled with "dry ice" (-21° to -28° C.) during load-deflection testing, in view of the fact that the fractures in the Rüdersdorf bridge had occurred in winter time.

Results of Load-Deflection Tests

Here are the results of the load-deflection tests :—

(1) Girders with stiffeners bearing on the flanges underwent a large amount of deformation without visible cracking before passing the maximum load.

(2) Cooling of the tension flange during welding (-4° to $+3^{\circ}$ C.) and during testing (-13° to -30° C.) together with permanent

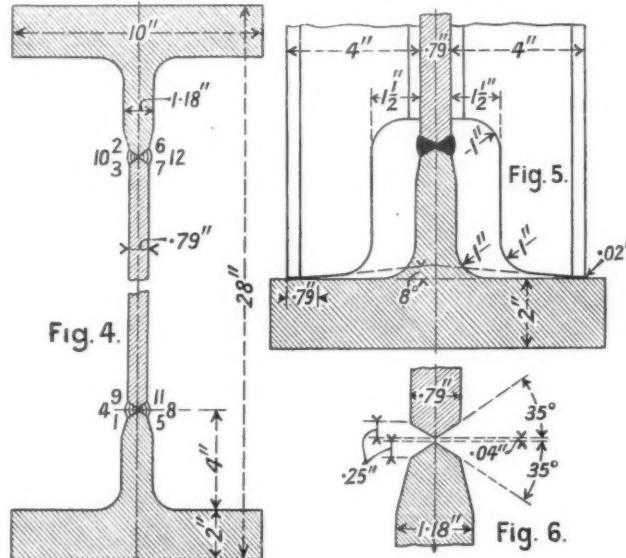


Fig. 4—Tee-section flange girders No. 7 to 10: Cross section and welding sequence

*Fig. 5—Ditto : Web-flange detail including stiffeners
(Girder No. 7)*

Fig. 6—Ditto: Web-flange detail (prepared for welding)

Further Investigations

These tests led to the following questions :—

(1) Is it possible to avoid cracking in, and adjacent to, the hardened zones of the web-flange welds at all?

(2) Is it necessary to prevent the formation of these cracks ?

To answer the first question, a series of girders with tee-shape flanges (Figs. 4, 5 and 6) were tested. The web-flange welds of these girders are 4 in. from the flange. The steel had about the same composition as that of the rib-flange girders, and essentially the same welding procedure was used. In general, shrinkage stresses were lower than in similar girders of the first series, and the distortion due to welding was considerably smaller because the tee-section has a greater modulus of resistance than the ribbed flange. Contrary to the experience with the rib-flange girders, no cracking at all occurred during welding of the tee-flange girders. Subjected to load-deflection testing, no cracks appeared, unless the

maximum tensile stress exceeded 11·4 tons per sq. in.; a few cracks were found at a maximum tensile stress of 15·2 tons per sq. in.; and cracks were numerous only after considerable deformation of the girders under the maximum stress in the extreme fibre of 33·5 tons per sq. in., i.e., in the neighbourhood of the tensile strength of the steel. Thus the tee-flange girder answers the first question in the affirmative. Regarding the second question, specimens machined from rib-flange sections with numerous fine cracks in the hardened zones were subjected to pulsating tension fatigue tests. They stood a total of more than 2,000,000 cycles of stress between 0·63 and 11·4 tons per sq. in., and proved, therefore, to be satisfactory.²

Thus it may be concluded that there is no necessity to avoid the fine transverse cracks in the hardened zones. Further tests showed, however, that the above conclusion cannot be maintained, and that the composition of the steel has to meet certain conditions. It will become necessary to introduce a minimum figure of bend angle with the notch-

weld bend test,³ say 40 deg. with flange plates of Steel 52 of 2-in. thickness. A new and simpler test method, a kind of notch impact test, is likely to replace the expensive notch-weld bend test, and an additional ageing test is under consideration.⁴ The committee's recent findings can be summarised as follows⁵:

(1) Rib-flange welded girders of Steel 52 are satisfactory, in spite of the presence of cracks in the hardened zones of the welds, of considerable shrinkage stresses, and of distortion of the flanges due to welding, unless the steel permits the cracks to propagate under the existing stresses.

(2) Tee-flange girders are superior to those with ribbed flanges. They show lower cooling rates and shrinkage stresses, less distortion of the flanges and no cracking in the heat-affected zones.

¹ THE RAILWAY GAZETTE, June 14, 1940, p. 830, and March 28, 1941, p. 365.

² The regulations of the German State Railway require for acceptance tests of Steel 52 at least 10·0 tons per sq. in. with transverse butt welds, and 11·4 tons per sq. in. with longitudinal welds.

³ THE RAILWAY GAZETTE, March 28, 1941, p. 366, Fig. 3.

⁴ VDI-Zeitschrift, April 12, 1941 (O. Graf).

⁵ American Welding Society, Journal, March, 1941.

100-WAGON FREIGHT CAR FERRIES

Two additional ferry steamers now under construction for Seatrain Lines Inc. will bring the fleet to five vessels, with a total capacity for 495 bogie freight cars. To the original service between New Orleans and Havana, Cuba, new services have been added in face of considerable opposition from affected transport interests, between New York and Havana, New Orleans, and Texas City

THE continued expansion of the operations of the American company known as Seatrain Lines Inc. makes appropriate a reference to this modern method of combining rail and water transport of freight. Originally devised as a communication between New Orleans and the island of Cuba, Seatrain is now operating regular services between New York and Havana, Cuba; New York and New Orleans; Hoboken, New Jersey, and Texas City; and Texas City and Havana. Five large wagon-carrying vessels are in service, and two more are on order and nearing completion. The original company, Overseas Railways Inc., was formed in 1927, but was not the first in the field for the through transport of railway rolling stock between the United States and Cuba, for the East Coast Car Ferry Company, an associate of the Florida East Coast Railroad, had been operating a car ferry between its southernmost terminal at Key West and Havana from 1914 onwards, and by 1927 was carrying a large proportion of the freight between the U.S.A. and Cuba. In 1929, however, the latter went out of action, just at the time when the Seatrain company was beginning operations. The latter's first vessel, the S.S. *Seatrain*, later renamed *Seatrain New Orleans*, made her first sailing from Belle Chasse, Louisiana, to Havana on January 12, 1929. She was built on the Tyne by Swan, Hunter & Wigham Richardson in 1928.

Design of Seatrain Ferry Steamers

From the first it was realised that the use of a train-ferry steamer of the traditional type, with tracks arranged on a single deck, and the wagons run on to and off the ship by means of connecting tracks at the terminals, would not be the most economical method of operation, in view of the length of sea journey involved—a total of 580 miles. *Seatrain New Orleans* was therefore planned with four rail decks, the lowest accommodating 26 cars, the second deck 26 cars, the upper deck 30 cars, and the superstructure 13 lightly-loaded cars, or a total of 95 cars, all of the standard American bogie type. The ship, which is 427½ ft. long, 62½ ft. in breadth, and with 25½ ft. draught, has a deadweight tonnage of 10,500, a gross tonnage of 7,684, and a speed of 11½ knots. Originally the schedule allowed 52 hr. between terminals, but this was later reduced to 48 hr. The Missouri Pacific RR., which has throughout been a strong backer of the Seatrain scheme, was responsible for building the Belle Chasse terminal; the main detail of the equipment, both here and at Havana, is the crane used for hoisting the wagons bodily into the ship. Each crane, electrically

operated and of 500 h.p., is of 115 tons capacity, and has a lifting speed of 50 ft. per min.; it is designed to handle 20 cars an hour. At the quayside the cars are run on to cradles which are lifted by the cranes and lowered to the required deck, the cars on arrival being manipulated to their positions by steam-driven winch arrangements; on the journey the cradles are used as hatch covers for each deck. The Seatrain equipment, with a force of 16 men, handles freight at the rate of 400 tons an hour, as compared with 18 men handling 30 tons an hour with a normal cargo ship.

Up till the time when *Seatrain New Orleans* went into commission, the principal seaborne traffic from Cuba to the United States had been sugar, and the majority of the cargo ships so engaged had made the return voyage in ballast. But before the new ferry steamer had been long in operation, new and profitable traffic was developed in both directions. For years Cuba had purchased coke for its gas plants from Great Britain and Germany; Seatrain, however, took loaded gondola cars of coke direct from Birmingham, Alabama, to Cuba, and returned the same cars with loads of manganese ore, scrap iron, and similar freights. In tank cars petrol, kerosene, lubricating oils, cotton seed oil, and similar commodities were carried to Cuba, and the same cars, after thorough cleaning, were brought back with low grade molasses for the feed manufacturers; approximately one-third of the early tonnage carried was in liquids. Refrigerator cars were used to convey apples, grapes, pears, melons, and lettuce from the Southern States to Cuba and to return with carloads of tropical fruits. In its first year, *Seatrain New Orleans* increased by over a million dollars the sale in Cuba of five selected products of southern U.S.A. industries. As a result of this success it was decided to extend the operations of the company. On November 27, 1931, the United States Shipping Board approved the company's application for a loan towards the construction of two new ships the contract for which was placed with the Sun Shipbuilding & Dry Dock Company of Chester, Pennsylvania. A mail contract was awarded to the new vessels, the value of which almost exactly balanced the annual loan repayments. These are larger and faster ships, designed to carry 100 freight cars each. They are 473 ft. long and 63½ ft. wide, and have a draught of 22 ft.; their gross tonnage is 8,445, and their speed 16½ knots, or 5 knots more than the original vessel. On the second deck there is provision for the simultaneous refrigeration of 26 standard refrigerator cars when carrying perishable traffic. In addition to their car capacity,

the lower portion of the hull of these ships is divided into tanks for the conveyance of liquid cargo in bulk, with a total capacity of 612,000 gal.

Seatrain New York and *Seatrain Havana* made their first sailings on October 6 and October 13, 1932, respectively, from New York direct to Havana and New Orleans. While the previous operation of *Seatrain New Orleans* had attracted no particular attention, the invasion of the port of New York by the new vessels, and the implications of the new service, foreshadowed so revolutionary a change in long-distance American transportation as to arouse a considerable stir; resentment and opposition were displayed by older-established transport companies both ashore and afloat, and litigation soon followed. The American Railway Association issued Car Service Rule No. 4, to the effect that "cars of railway ownership must not be delivered to a steamship, ferry or barge line for water transportation without written permission of the owner filed with the Car Service Division." Shippers, however, took advantage of the fact that a tariff sheet had been filed with through rates *via* Seatrain; and the United States Shipping Board, while temporarily suspending the mail contract, granted a temporary permit for the vessels to operate for six months from New York pending the Court's decision. The railroads themselves were divided into two camps. The Texas and Pacific had now joined the Missouri Pacific in backing the Seatrain scheme, and between them these railways held the major part of the Seatrain capital, whereas the Southern Pacific, which occupied a dominating position in the New York—Texas freight traffic by its ownership of the Morgan Lines, was in opposition. Further, the Eastern railroads, which stood to lose overland freight traffic, claimed that the loans by the Missouri Pacific and Texas Pacific to Seatrain Lines Inc. were a violation of the Panama Canal Act, and that the latter company was not entitled to a Government mail contract as it was not engaged in foreign commerce.

Other railways serving ports on the Gulf of Mexico contended that Seatrain was really providing a railroad service, and was therefore subject to all the restrictive regulations of the Interstate Commerce Commission imposed on carriers by rail. The opposition went to the extent of attempting to increase the car maintenance debit against Seatrain from the standard \$1 *per diem* to \$10, on the ground of increased corrosion of the cars while at sea, whereas investigation proved that the boot was on the other leg, and that maintenance was actually reduced owing to the cars being motionless while in transit. As a result of these and other investigations on the part of the Interstate Commerce Commission, rulings were made that disposed effectively of the opposition. The first of these was that, according to the Act to Regulate Commerce, Seatrain was not to be regarded as an extension of a line of railroad. Then, in February, 1935, the I.C.C. ruled that the operations of Seatrain in transporting loaded freight cars between New York, New Orleans, and Havana was in the public interest, and that the railroads

must interchange cars with the company, and also post rates *via* Seatrain with the I.C.C. not later than April 5, 1935. It finally ruled that the Missouri Pacific and Texas Pacific Railroads were entitled to continue their investments in Seatrain. Since then the operations of Seatrain Lines Inc. have proved so successful that on July 6, 1939, an order was placed with the Sun Shipbuilding & Dry Dock Company for two further ships, at a cost of approximately \$2,000,000 apiece, as compared with the \$700,000 paid for the first vessel. The resources of the company are now such that these vessels are being built without Government assistance, which is something new in U.S. shipping circles.

Ferry Terminals

At present Seatrain Lines Inc. make use of three terminals in the U.S.A. The New Orleans terminal is on the west bank of the Mississippi, 10 miles below the city and about 100 miles from the open sea, on the New Orleans & South Coast RR., which from 1926 has been controlled by the Missouri Pacific. The Havana terminal is at Hacendados, on the United Railways of Havana, with through connections to all parts of the island. In Hoboken the Seatrain ships are served by the Hoboken Manufacturers' Railroad, which was incorporated in 1902, purchased by the U.S. Government in 1917, re-sold in 1927 to the Hoboken Railroad & Terminal Company, and acquired by Seatrain in 1932. The crane at this terminal, which serves the New York area, has a capacity of 125 tons. An inland depot at Manhattan, New York, is operated by the Southwestern Terminal Company Inc., in connection by road services with the Seatrain vessels, transfer of the freight to and from the cars taking place at Hoboken. A more recent development is the agreement entered into by Seatrain, on July 6, 1939, with the Texas City Terminal Railway, which has resulted in a Seatrain terminal being built at Texas City, 4 miles from Galveston. The last-named railway was incorporated in 1921, and the share capital is jointly owned by the Santa Fe, the Missouri, Kansas & Texas, and the New Orleans, Texas & Mexico Railroads. Seatrain also has a contract with the American Refrigerator Transit Company for the lease of refrigerator cars. Later it is hoped to extend the through Seatrain freight car facilities to ports in Mexico, Central America, and Canada; and the view now held is that the railways stand ultimately to gain rather than to lose by the extension of this economical method of coastwise transport over long distances. For the time being, however, it has been necessary to curtail the operations of Seatrain Lines Inc., as the United States Maritime Commission has taken over two of the vessels—*Seatrain Havana* and *Seatrain New York*—for conversion to tankers, in order to meet the needs of national defence; it is the services between New Orleans, Texas, and Cuba that have been chiefly affected. We are indebted to an article by Mr. Lewis Wroe in the September-October, 1940, issue of our American contemporary *The Railroad Enthusiast*, for the facts upon which the foregoing notes have been based.

CONTROL OF MACHINE TOOLS (ELECTRICAL EQUIPMENT) (No. 1) ORDER, 1941.—This Order concerns electrical equipment for machine tools, and its purpose is to introduce a measure of standardisation for such equipment in order to facilitate the flow of production. Supplies of machine tool electrical equipment have to be planned in advance, and the machine tools must usually be built and electrically equipped before their allocation to a particular user. Special specifications, preferences for particular makes of equipment, and in particular the widely varying conditions imposed by the local electric supply authorities, have all hampered the efficient planning of supplies of electrical equipment for machine tools. In view of this the Order provides:—

1. That all such electrical equipment manufactured in the United Kingdom after January 1, 1942, shall comply with British Standard Specifications.

2. That indicating instruments shall not be fitted unless they are essential to the efficient operation of a machine tool.

3. That electric supply authorities shall not refuse to supply electricity to users requiring to start direct-to-line on a 3-phase system, a motor of a capacity not exceeding 5 h.p. or requiring to use on such a system a squirrel-cage motor of a capacity not exceeding 30 h.p.

4. That no person shall, by virtue of any contract, be entitled to demand delivery of electrical equipment produced by a specified maker or of a specified brand, or to require the equipment to be subjected to any test other than is necessary to establish compliance with British Standard Specifications. Tests required by the machine tool makers are excepted from this provision.

Copies of the Order may be obtained from H.M. Stationery Office, York House, Kingsway, London, W.C.2, price 1d. Trade enquirers can obtain further information from the Director of Industrial Electrical Equipment, Machine Tool Control, Ministry of Supply (Code V.A.), 35, Old Queen Street, S.W.1. Telephone: Victoria 9040, Ext. 287.

TEST CODE FOR OPEN-HEARTH MELTING FURNACES.—A test code, in two parts, for open-hearth melting furnaces for the refining of steel has just been issued by the British Standards Institution (B.S. No. 979—1941). Part 1 is a short code for carrying out simplified industrial tests for evaluating the performance of furnaces as effective and economic units; and Part 2 is a comprehensive code for the complete evaluation of performance and efficiency. Copies may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 5s. 6d., post free.

ROAD TRANSPORT SECTION

This section appears at four-weekly intervals

Rapid Increase in Sino-Burmese Civilian Traffic

MUCH has been written of late concerning the concentration of munitions and war supplies for the Free Chinese Government upon Rangoon and the Burma Road, but little note has been made of other commodities, constituting the ordinary civilian requirements of Western China, also gravitating to the Burma route. During the second half of 1940 the Japanese blockaded the frontier opposite Hong Kong and also the whole coastline from Chekiang to Kwangsi inclusive, and supplies *via* Indo-China were also cut off by the Japanese occupation of that country. As a result, all exports from and imports to Western China have been forced to use the port of Rangoon which has correspondingly developed greatly. The Chinese Consulate there has been raised to a Consulate General, and there has been a great increase in the number and size of the Chinese commercial banks and agencies, the additions staffed largely by personnel transferred from Hong Kong and Manila. Figures indicative of the rise in Chinese merchandise exported through Rangoon are not available, but it is stated that this port has now become more important than Hong Kong as a point of transhipment of such exports. Statistics showing the growth in value of merchandise—other than war material—imported into Burma for re-export to China during 1940 speak for themselves. For the first quarter of 1939 no figures are available, but for the period April to December inclusive, the value of imports despatched from Rangoon for China was Rs. 2,07,11,401 (£1,553,325), whereas in the corresponding period of 1940 it had risen to Rs. 8,56,90,438 (£6,426,783), an increase of about 414 per cent. These imports consisted principally of motor vehicles and parts, iron and steel products, electrical appliances and scientific instruments, machinery and parts, petroleum and petroleum products, and cotton textiles, arranged in order of value, and accounting for roughly two-thirds of the total other than war material imported. The value of motor vehicles transhipped during 1940 was about one-sixth of the total, and there are reported to be over 1,500 lorries working over the Burma Road alone. Moreover, large numbers of the 5,000 more on order are arriving, and by the end of this year it is expected that between 6,000 and 7,000 will be in service on the road. These will help to swell the volume of imports still further. It will, therefore, be seen that the trans-Burma traffic is by no means confined to war supplies, and there is every indication that the nucleus of a substantial post-war Sino-Burma trade is already being built up to provide a reasonably heavy traffic over the new railway now being constructed parallel to the road.

Railway Road Services in Italy

With a view to relieving the pressure on railway goods traffic facilities, and to improving the use of the goods rolling stock, the Italian State Railways various certain road motor services as far back as 1940, as has already been recorded in our columns. These services deal generally with the parcels traffic of certain heavily overtaxed railway lines, since parcels vans are seldom used to capacity. In practice, nothing is changed for the railway user, as goods must be handed in at railway stations, accompanied in the usual way by their bills of loading; it is for the railway administration to decide whether they will be despatched by rail or by road. The road motor services are operated under contract by private motor hauliers, who must give guarantees regarding their technical and commercial reliability, and as to regularity of service.

The first of these railway-controlled road motor goods services was begun in April, 1940, between Milan and Turin, a distance of 126 km. (78 miles). At present the point-to-point stopping services (the so-called omnibus routes) operate over 4,400 km. (2,734 miles), while fast town-to-town services extend over 2,700 km. (1,677 miles). In 1940, some 23,905 trips, aggregating 3,785,730 km. (2,350,938 miles), were made. The weight

of the goods so transported amounted to 240,000 metric tons, representing the tonnage of about 62,000 goods wagons. Apart from these, goods transit services are worked by road motor between stations within a town. This particular traffic totalled 129,353 metric tons in 1940, equal to the loads of about 31,500 railway wagons. Goods traffic on the Italian State Railways having increased by about 20 per cent. in 1940, the institution of these road motor services brought appreciable relief to the railway goods traffic facilities, and considerably improved their regularity.

A Surviving Cheap Fare Facility

Trolleybus and tram unlimited travel tickets

1/- DAY TICKET

ISSUED after 10 a.m. weekdays
All day Sundays and public holidays



6d EVENING TICKET

ISSUED after 6 p.m. Mondays
to Fridays public holidays excepted



Tickets not transferable



As a result of wartime travel difficulties, many cheap fare facilities have been withdrawn, but the unlimited travel tickets available on London Transport trolleybuses and trams, to which the above poster refers, are still retained, mainly because they are issued after the peak hours are over. The 1s. all-day tickets were first introduced by the London County Council, on January 3, 1925, and were available on Saturdays and Sundays only; they became available every day from July 21, 1925. The 6d. evening tickets, available every day, were introduced on May 1, 1932, also by the L.C.C. The latter privilege was withdrawn when the London Passenger Transport Board came into existence, but was restored shortly afterwards, with the limitation to Mondays-to-Fridays-only.

Northern Ireland Road Transport Board

Record traffic receipts—Improved financial position and prospects

THE report of the Northern Ireland Road Transport Board for the year ended September 30, 1941, shows an operating profit of £286,794, which has been arrived at after setting aside £185,000 for depreciation and deferred maintenance, and providing for war damage insurance. Receipts from traffic amounted to £2,085,766, as compared with £1,043,116 for the previous year. Expenditure, including depreciation and deferred maintenance, totalled £1,798,972, as against £975,643 in the previous year. To the operating profit of £286,794 has to be added other receipts of £10,484, making a total of £297,278, from which has to be deducted the miscellaneous rents of £8,427, leaving a credit balance of £288,851, and after charging interest on consideration for undertakings acquired, £429, the credit balance to be carried to the appropriation account is £288,422, comparing with

where, for various reasons, a combined service could not do the job altogether, to supplement with road services to the necessary degree. Services were withdrawn temporarily from some routes which were served by rail, including some of the most profitable routes. On these the board has been running services to feed the railway stations. Its policy has been to concentrate on the service of places where railway communication was out of the question, or where the railway could not, by any means, handle the whole of the traffic. A hopeful element in the situation for the future is that much of the critical attitude of traders and others towards the board's activities has died down. The staff of all grades has been working throughout the year under conditions of great difficulty and strain, and has given the most ungrudging service.

Under authority of the Ministry of Home Affairs for Northern

SUMMARY OF FINANCIAL RESULTS

Financial results	Year ended September 30, 1936	Year ended September 30, 1937	Year ended September 30, 1938	Year ended September 30, 1939	Year ended September 30, 1940	Year ended September 30, 1941
	£	£	£	£	£	£
Capital—						
Northern Ireland Transport stock issued and outstanding at September 30...	,807,278	832,508	844,299	844,299	844,299	844,299
Capital expenditure at September 30 ...	1,208,606	1,908,861	3,009,985	3,500,907	3,634,224	3,585,216
Receipts—						
Traffic receipts ...	676,731	781,634	926,472	967,576	1,043,116	2,085,766
Miscellaneous receipts ...	4,280	2,860	3,956	4,277	8,150	10,484
Total	681,011	784,494	930,428	971,853	1,051,266	2,096,250
Expenditure—						
Buses and coaches ...	566,626	534,866	523,001	497,227	445,015	670,808
Goods vehicles ...	77,326	219,018	354,707	330,617	393,581	942,160
General expenses ...	73,617	97,790	124,970	132,049	137,047	186,004
Miscellaneous charges ...	35,025	50,389	53,721	20,476	9,637	8,856
* Total	752,594	902,063	1,056,399	980,359	985,280	1,807,828
Balance per revenue account ...	Dr. 71,583	Dr. 117,569	Dr. 125,971	Dr. 8,506	Cr. 65,986	Cr. 288,422
Interest on loans ...	2,051	10,947	34,350	68,093	121,986	128,981
Interest on Northern Ireland Transport stocks ...	20,414	33,713	8,206	20,532	33,619	—
Appropriations—						
Redemption of "A" stock fund ...	—	—	—	—	—	7,463
Reserve for superannuation and pensions ...	—	—	—	—	—	5,000
General reserve fund ...	—	—	—	—	—	10,000
Appropriation account balance, per last account ...	—	—	—	—	—	Dr. 611,554
Appropriation account balance at September 30	Dr. £94,048	Dr. £256,277	Dr. £424,894	Dr. £521,935	Dr. £611,554	Dr. £474,576

£65,986 for the previous year. The accompanying table shows that for the first three financial years of the board there were substantial debit balances, but an improvement began to be shown in the year 1938-39 when the debit balance was not more than £8,506.

Although the profits earned in the year under review were sufficient to cover a year's interest on the loans outstanding with the Ministry of Finance, and on the whole of the stock issued by the board, it has been necessary to apply all the cash that could prudently be released from the undertaking to the payment of interest and arrears of interest on the Ministry of Finance loans, rather than the payment of interest on the stock. Within the year instalments of £65,000 were paid to the Ministry on account of interest, and a further sum of £100,000 was paid to the Ministry in this connection immediately after the close of the financial year.

There was a phenomenal increase in the demand for transport during the year. This increase in demand was not confined to any one section, but was general throughout the services. Difficult and very serious problems, although of a different kind from those which have confronted the board in the past, have arisen from this increase in traffic. It had to provide for a very large increase of traffic with a depleted fleet which was increasingly difficult to maintain in an efficient condition, and with the assistance of the Ministry of Home Affairs, it took every possible step to augment the fleet. The board accordingly organised a large-scale hiring of privately-owned vehicles to work for it. It was found possible in some cases to use both road and rail to get through, and

Ireland details of traffic receipts and of working expenses have been omitted. It is noted that the provisions of the Road and Railway Transport Act (Northern Ireland), 1935, relating to the pooling scheme with the railways, have been inoperative since October 1, 1935. The undertaking of R. H. Abraham was transferred to the board on November 30, 1939. The consideration for the transfer was £1,750.

Shoes Instead of Trolley Wheels

Some interesting details of the experience of the Transport Department of the George Town Municipality, Penang, are given in the annual report of that authority for the year 1940, during which year the undertaking completed its 35th year of working. Both trams and trolleybuses are in use there and the Transport Manager, Mr. T. Rogers, records that trolley wheels have all been scrapped in favour of shoes with carbon inserts. Additional trolley booms were fitted and the system unearthed. The overhead negative was fitted with section insulators, and control boxes were changed for double switching. Additional rectifying units have been installed to improve pressure on certain sections. The changeover to shoe-type collectors has been found to effect a great improvement on the trolley wheels, as the shoes are more economical and are less noisy when the trolleybuses are running at full speed. The wear on the overhead line is also found to be less. The traffic figures for the system during 1940 were: passengers carried, 14,644,255 (12.48 per cent. increase) giving a revenue of \$326,929 (£38,142) against an expenditure of \$246,682 (£28,780).



Two views of a British-built trolleybus designed for service in Durban, South Africa, but introduced into London service last month as a war emergency measure. The interior view shows the lower deck (see page 674)



Left: One of the Thornycroft Sturdy class 6-ton lorries in the service of the Southern Railway



Right: Large - capacity rigid 6 - wheel Thornycroft chassis mounted with a special three-compartment body for carrying first and native class passengers as well as mail on the road motor services of the South African Railways

The African Great North Road



Africans at work in Tanganyika Territory on the Dodoma-Iringa section of the Great North Road

THE decision was taken recently, on military grounds, to reconstruct the Great North Road through eastern equatorial Africa from the Northern Rhodesia border to Nairobi. Brief reference to this has already been made in our columns, and it is now announced that the road is to be made available for use at all seasons, so as to serve both military needs and also the post-war economic development of the districts traversed. The section of the road now being reconstructed lies mainly in Tanganyika Territory, through which the Great North Road runs for 810 miles from south to north. The remaining distance through Kenya to Nairobi is 118 miles. The Tanganyika Central Development Committee, which reported last year, placed the improvement of

the road system in the forefront of its programme, and headed its proposals in this connection with the reconstruction of the Great North Road up to strip standard. One curious fact in the telegraphic advices on the subject is the estimated cost. *The Times* correspondent at Nairobi gives the amount to be expended as only £355,000. The Tanganyika Development Committee, while admitting the difficulty of estimating for such works, allowed £850 per mile, which for the 810 miles in Tanganyika alone works out at £688,500; and, with the stretch of road to Nairobi added, the total cost would be over three-quarters of a million. The employment of military labour may be the explanation of the lower estimate of the military authorities.



A view of the Great North Road as at present constructed, between Malagali and Iringa

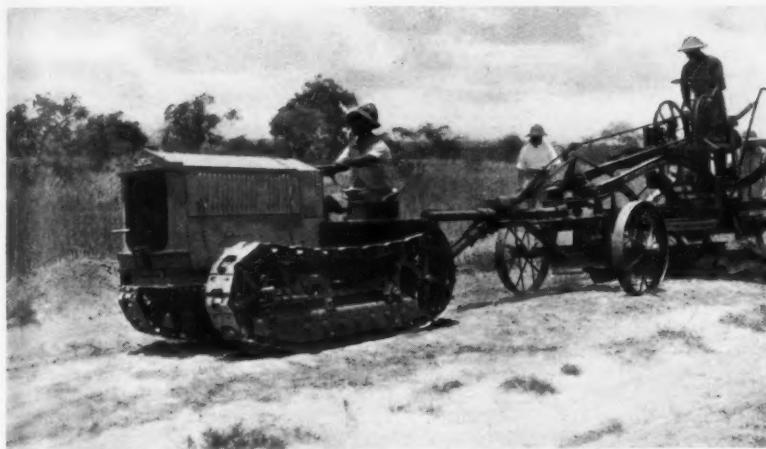
Bridge
Dodom

At work
Though

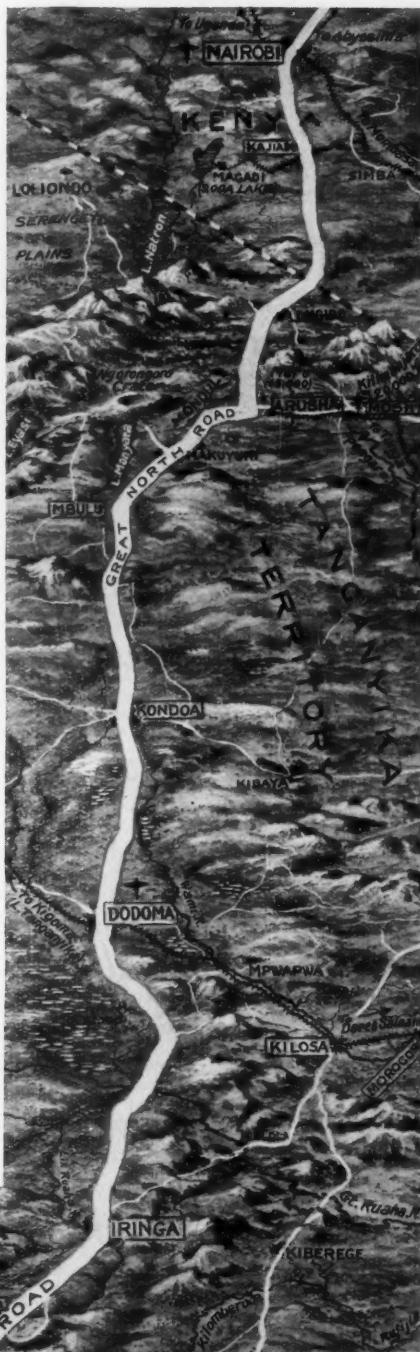
The Great



Bridge carrying the Great North Road over the Ruaha River, between Iringa and Dodoma. With two main spans of 130 ft. each, and two approach spans, each of 37 ft., the bridge is over 100 yards long



At work on the Great North Road in Tanganyika Territory, south of Iringa. Though manual labour was employed extensively in the initial stages of the road, machinery has penetrated almost everywhere



The Great North Road through Tanganyika. From the south it has come across Northern Rhodesia; northward it goes on into Kenya

Tram, Bus, and Subway Service in New Jersey



Public Service bus of the Summer Avenue Route No. 28 connecting with City Subway Route No. 7 at the Franklin Avenue station. This bus operates during the rush hours over the newly-completed section of Franklin Avenue and provides faster service to the shopping area and the Pennsylvania Railroad station in Newark

THE Public Service transport companies, subsidiaries of the Public Service Corporation of New Jersey, operate trams and buses in a territory with a population of approximately 3,800,000 persons in 371 New Jersey municipalities, and brief details of the group have appeared from time to time in our columns. The service provided by Public Service vehicles covers or reaches into every county in New Jersey except Hunterdon, and extends from the New York State line at the north to Cape May in the south. The northern portion of the State is part of the densely populated New York metropolitan area, while the Philadelphia metropolitan area extends into Camden and a number of adjacent counties in southern New Jersey. Bus lines operated by the Public Service Interstate Transportation Company link New Jersey

to the centres of New York and Philadelphia. The variety and extent of Public Service plant and equipment for carrying upwards of a million passengers a day on its more than 200 bus and 8 tramcar lines services are striking features of the business. The group operates nearly 3,000 buses, and maintains 53 garages and carsheds and two shops for major repairs.

In Newark, the Public Service organisation maintains a tramcar service through the City Subway, which was built by the City of Newark and leased to Public Service. An extension of the subway to Franklin Avenue was opened for traffic in August last, and the new Franklin Avenue station, shown in the accompanying illustration, provides a useful interchange point between tram and bus.

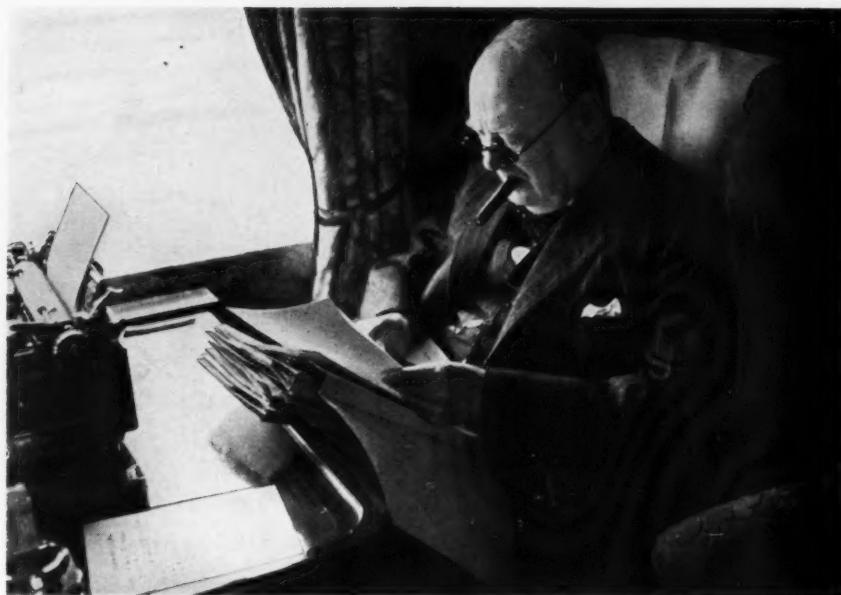
Brisbane (Queensland) Tramways

BRISBANE, the capital city of Queensland, has had a tramway system since August, 1885, when there were six miles of track served by a small fleet of horse-drawn trams. In early years the working of this undertaking proved unsatisfactory and receipts frequently failed to cover working expenses. Efforts were made to secure capital to convert the tramways to electric traction, but without success. On November 14, 1895, however, a new company entitled the Brisbane Tramways Co. Ltd. was formed with head office in London and acquired the interest of the original proprietor. The new owner at once proceeded to convert the line and electric trams began to run in July, 1897, at which period there were 15 route miles, 33 electric trams, and 24 horse cars in operation. Another London company—the Brisbane Electric Tramways Investment Co. Ltd.—was formed on November 20, 1900, and acquired practically all the shares of the 1895 company holding the concession. On December 31, 1922, the system, which had grown by that time to 42 route miles, was purchased by the Queensland Government and vested in the Brisbane Tramways Trust, a body elected by the

Councils served by the tramways, with two Government representatives as Chairman and Deputy Chairman respectively.

On December 1, 1925, the tramway system was transferred from the trust to the Brisbane City Council under the Greater Brisbane scheme, and has since been operated as a department of the council. At June 30, 1939 (the latest date for which complete figures are available), the system comprised 60 route miles of 4 ft. 8½ in. gauge line (107 miles of single track), served by 375 cars. When the system was taken over from the company at the beginning of 1923 the purchase price was £1,400,000 ; by June 30, 1940, the value of the assets, after allowing for depreciation, had increased to £2,747,424. During the year ended June 30, 1940, the car miles run were 8,164,288 ; the number of passengers carried totalled 93,430,881. Many interesting comparative statistics embracing the period from the inception of the Brisbane City Council in 1925, to the end of the financial year 1939-40, are given in an official volume entitled "Brisbane Statistics, 1940," of which we have recently received a copy.

A Pictorial Retrospect of 1941



The Prime Minister at work in the special train which he uses extensively for travelling about the country



A trainload of tanks built in British factories moving over the L.N.E.R. on the way to the Russian front



This illustration, in conjunction with that on the opposite page, gives a striking impression of the speed with which railway engineers have repaired bomb damage



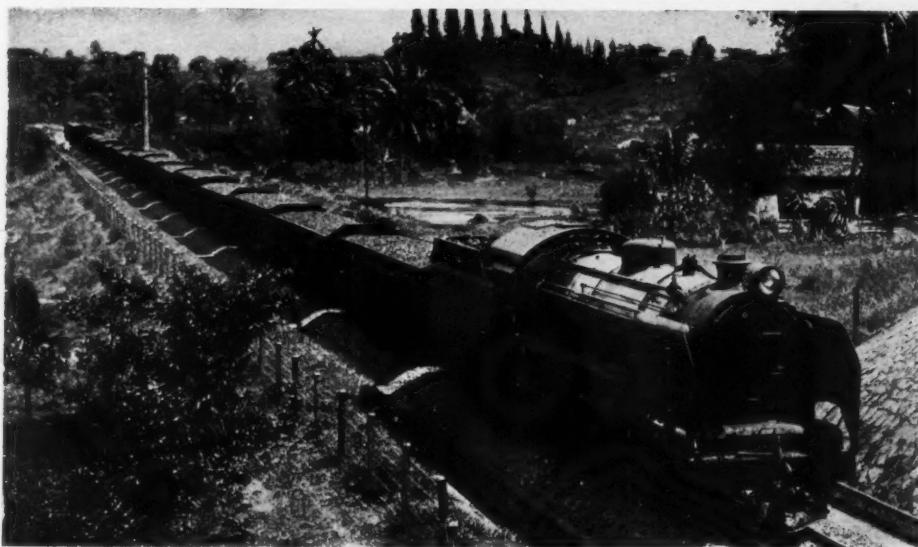
An L.M.S.R. employee at Kentish Town, believed to be the first woman "knocker up" in this country



Women porters on the L.M.S.R. at work during a periodical respirator drill



This illustration and that on the opposite page were taken on the L.N.E.R. in the eastern suburbs of London. They show (opposite) a bomb crater, and (above) the same spot a few hours later



Above: Station on a military instructional railway. The locomotive is a W.D. standard L.M.S.R. 2-8-0 type

Left: Mineral train approaching Singapore. Malaya, now in the war, has over 1,000 miles of railway

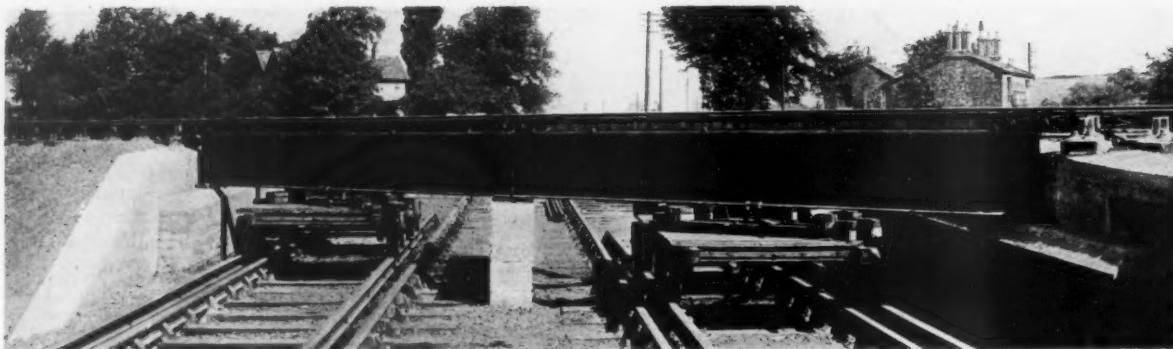
Photograph by courtesy of Malayan Information Agency



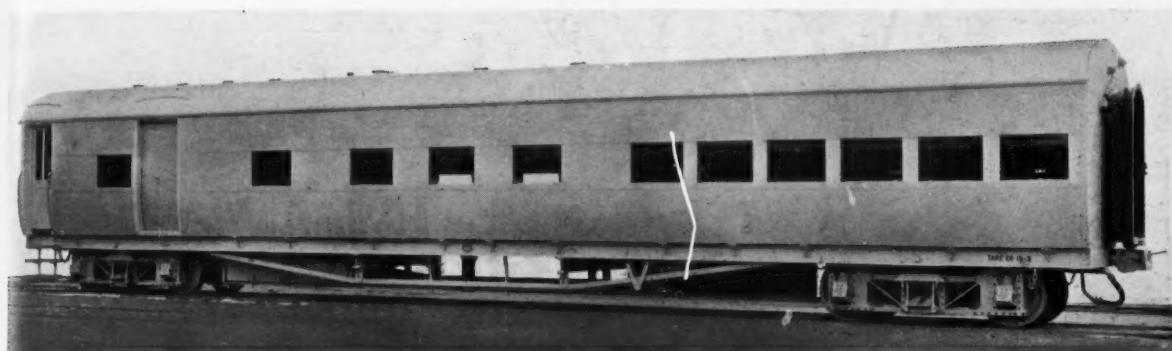
Two of the three new English locomotive classes of the year, the 1,740 h.p. 1,500-volt d.c. electric locomotive and the 2-6-2 "Bantam Cock" steam locomotive, L.N.E.R.



Unloading by jib crane one of the trailer fire pumps from a G.W.R. fire-fighting train. The equipment of a train includes two light petrol trailer-type pumps housed in a special van allowing the pumps to be handled either through double end doors or through centre doors by means of a swinging jib



The bogie bridge evolved by English railways for use in war-time emergencies to carry a damaged line over another. The pier seen in the six-foot reduces the span of the skew emergency bridge by half



A dining car built in England for the 3-ft. 6-in. gauge lines of the Nigerian Railway



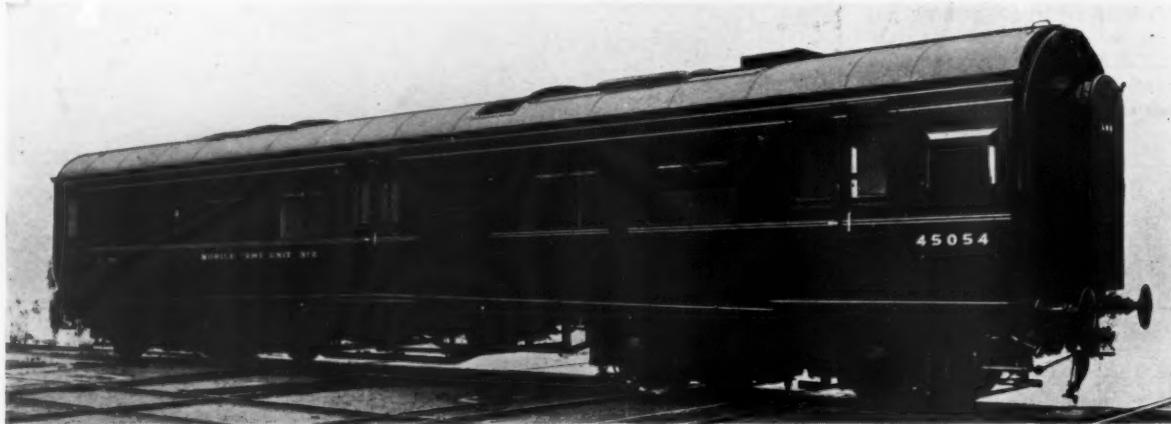
A 2-ton Dennis lorry with a Mark II anthracite-burning gas producer in service on the L.M.S.R. It forms one of a number of developments of that company in the use of alternative fuels



The first of the three-car 420-b.h.p. diesel-mechanical trains on the G.W.R.; the centre vehicle is an ordinary 70-ft. coach



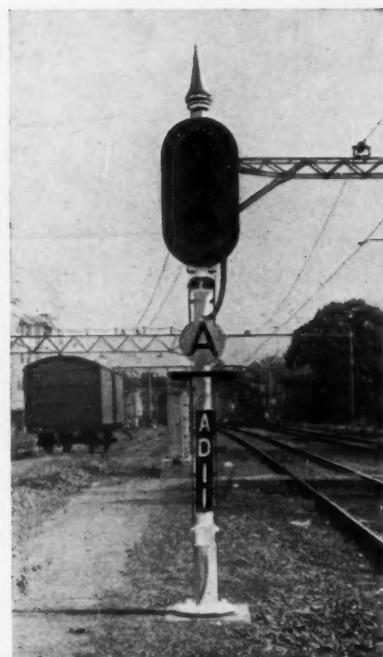
The second of the Merchant Navy class of three-cylinder Pacific engines with 6 ft. 2 in. wheels now being built by the Southern Railway for the Salisbury-Exeter line



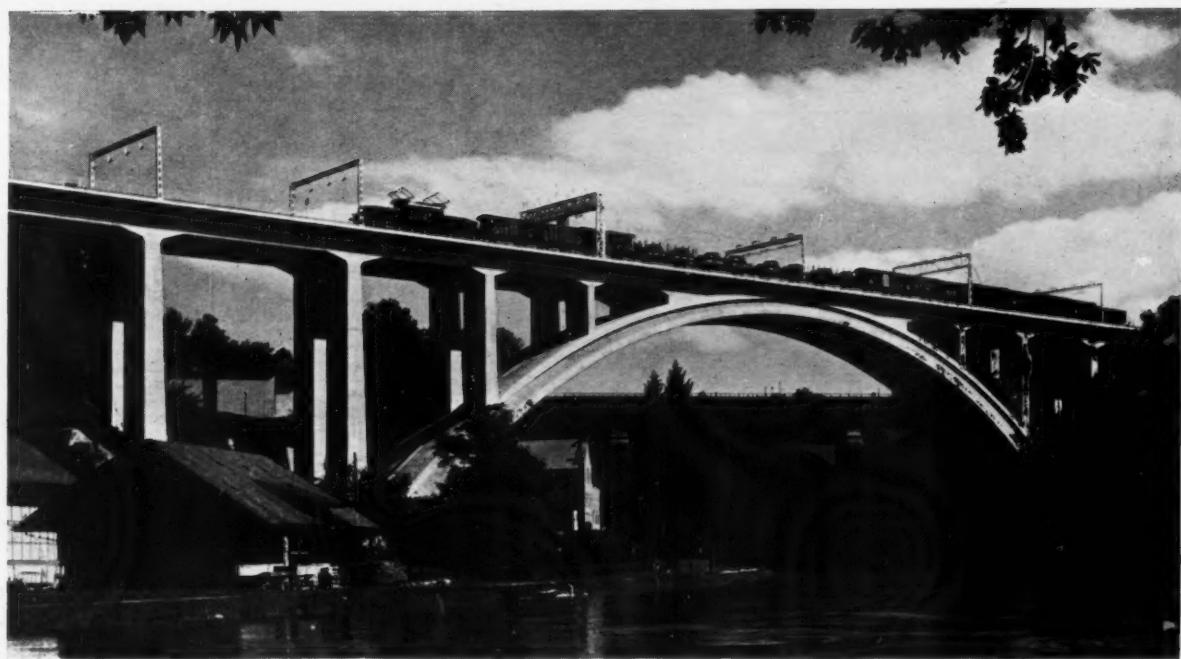
Mobile testing unit used in track tests of steam locomotives by the L.M.S.R.



A mobile canteen for use of Great Western Railway employees



Above : One of the automatic colour light signals with "A" marker signs being introduced on to the G.I.P.R. as part of a signals modernisation programme. Left : One of the armoured trains said to have been used extensively by the Russians on the eastern front



The new bridge over the Aare at Berne, built by the Swiss Federal Railways as part of a rearrangement of lines to the north-east of the Swiss capital (see editorial note at page 634)



A Southern Railway firefighting train, which carries 15,000 gal. of water

Above : Concrete sleepers being used on a section of the Trans-Saharan Railway under construction near Colomb-Bechar

*Speeding up loading and delivery.
Right : A mobile crane in use on the L.M.S.R.*



A platform view of one of the many L.P.T.B. tube stations which have been fitted with bunks and are used nightly as air raid shelters

VACUUM BRAKE DEVELOPMENTS

Notable improvements in the design of vacuum brake ejectors and automatic steam brake valves

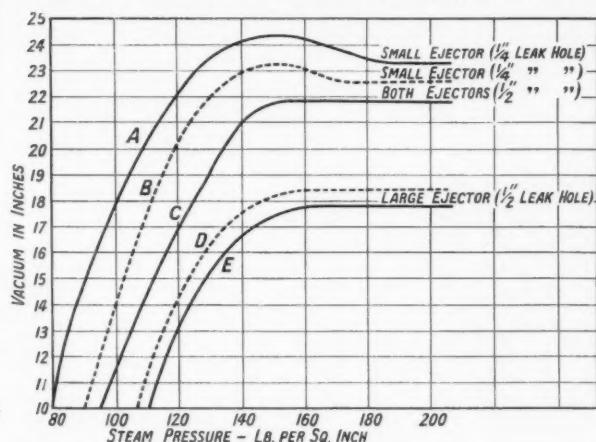
A NOTABLE development in the design of vacuum brake equipment is represented by the Gresham S.-J. ejector and Mark IV graduable steam brake valve. The former incorporates the usual release and maintaining cones which are of the solid jet type designed to suit the high boiler pressures common in modern locomotives. As can be seen from the drawings the design is such that the two sets of cones are completely isolated from each other. The effect of this is to eliminate the mutual interference between the

two steam jets which has been a fault of previous types; it is a modification which has resulted in a marked improvement in performance and efficiency, as will be seen from the graph.

A novel feature is the arrangement of the main air clack 3 which operates to isolate the train pipe from the action of the maintaining jet in the brake "on" position, so that the latter continues to draw on the auxiliary pipe to maintain full working vacuum in the locomotive vacuum chambers. A bell crank 1 is operated by a cam on the main shaft to depress the sleeve 2 as the ejector handle is moved towards the full-on position and is so arranged that in the final position of the handle the main clack is held closed by the predetermined force developed in the spring 4. The main clack thus operates as a relief valve to prevent overcharging of the locomotive chambers and allows the standard relief valve to be more effectively located on the train pipe side of the clacks.

Both the air and steam admission valves are operated by direct lift fingers on the main shaft, thus eliminating all side thrust and consequent wear of the spindles and bearings. A departure from previous general practice is the provision of this ejector in two models, designated Type G and Type P respectively. The difference between these two types is in the relative size of the release and maintaining cones. The Type G ejector is provided with a relatively large maintaining cone of sufficient capacity to ensure the maintenance of full working vacuum against a high leakage factor on long freight trains. The Type P ejector is fitted with a smaller maintaining cone and a correspondingly larger release cone than the Type G, and is intended for use on locomotives designed specifically for passenger service where good maintenance can be anticipated and where the length of the train pipe is only moderate. Under these conditions a relatively small maintaining cone is adequate for the duty and represents a very material saving in steam consumption.

The Mark IV steam brake valve which we illustrate in combination with the S-J ejector is a development of pre-



STEAM CONSUMPTION

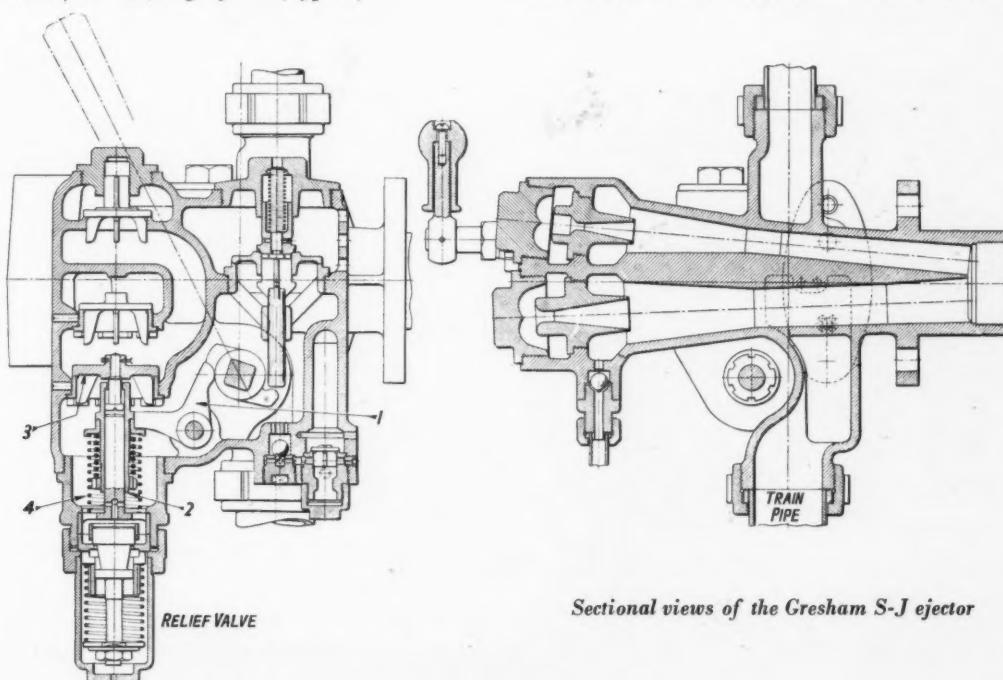
495 lb./hr. - A, small ejector (Type G)

340 lb./hr. - B, small ejector (Type P)

(Total) 1,265 lb./hr. - C, large and small ejectors (Type G or P)

925 lb./hr. - D, large ejector (Type P)

770 lb./hr. - E, large ejector (Type G)



Sectional views of the Gresham S.-J. ejector

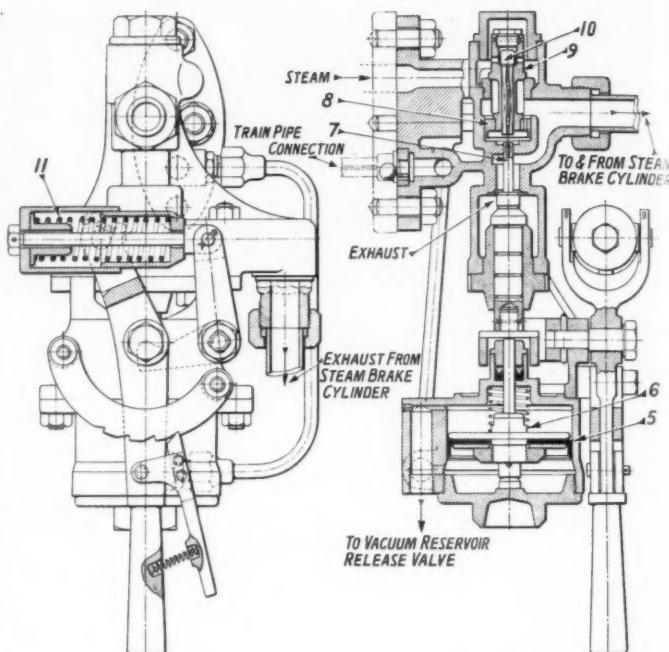
vious types and has been introduced to simplify construction, reduce maintenance costs, and improve retaining power for heavy gradient service. It consists essentially of an upper steam portion and a lower air portion attached to an intermediate bracket ; its operation is as follows :—

Train pipe vacuum is maintained on both sides of the air piston 5 which is held in its lowest position by spring 6. At the same time steam at boiler pressure is supplied to the chamber above valves 9 and 10 and the steam brake cylinders are open to exhaust past piston valves 7. Application of the vacuum brake on the train admits air to the underside of the piston 5 which moves upwards to lift the steam operating unit, the first movement of which closes the steam brake cylinder exhaust valve 7. Further upward movement then raises the pilot valve 9 to admit steam below the balance piston 8 and allow the main steam valve 10 to open and pass steam direct to the brake cylinders.

This condition persists until the steam brake cylinder pressure acting downwards on the exhaust valve 7 is just sufficient to overcome the upward pressure on the air piston 5 which is then forced down to allow valves 9 and 10 to close. Further downward movement of the air piston on release of the train brake permits the opening of the steam brake exhaust valve and a corresponding release of the locomotive brake. A state of balance between the vacuum and steam brakes is thus established, the area of air piston 5 being proportioned to ensure that the maximum steam brake application corresponds to a full vacuum brake application from 20-in. initial vacuum.

Independent manual operations of the locomotive steam brakes is available through the medium of the hand lever, quadrant and compression spring 11. This is so arranged that the degree of steam brake application is proportional to the compression of the spring, a full application being obtained when the lever is pulled into the last notch.

We were recently afforded an opportunity of examining



The Mark-IV. gradable steam brake valve

the ejector and steam brake valve at the maker's works in Manchester, and were impressed by the compactness and simplicity of the design in which the complete alignment of the operating parts will ensure a minimum amount of wear.



Above : The S-J ejector

Left : Combined ejector and steam brake valve

RAILWAY NEWS SECTION

PERSONAL

L.N.E.R. STAFF CHANGES

The services of Mr. W. McA. Gracie, Assistant Goods Manager, Southern Area, have been placed at the disposal of the Ministry of Food. During Mr. Gracie's absence, Mr. M. A. Cameron, Assistant to Passenger Manager, Southern Area, will take over his duties as Assistant Goods Manager. Mr. C. G. G. Dandridge, Advertising Manager, will in turn act as Assistant Passenger Manager, Southern Area, while retaining his present post.

G.W.R. STAFF APPOINTMENTS

Mr. L. W. Conibear, Office of the Superintendent of the Line, to be Assistant Divisional Superintendent, Bristol.

Mr. B. L. Macassey, Assistant and Chief Clerk to the Divisional Superintendent, Exeter, to be Assistant Divisional Superintendent in the same division.

Mr. G. E. R. Penney, Junior Assistant to the Divisional Superintendent, Exeter, to be Chief Clerk in the same division.

Mr. J. F. M. Taylor, Chief Clerk to the Divisional Superintendent, Worcester, to be Assistant Divisional Superintendent in the same division.

Mr. S. C. Harvey, Office of the Superintendent of the Line, to be Chief Clerk to the Divisional Superintendent, Worcester.

Mr. O. Velton, Chief Clerk to the Divisional Superintendent, Gloucester, to be Assistant Divisional Superintendent in the same division.

Mr. D. Bartlett, Junior Assistant to the District Traffic Manager, Plymouth, to be Chief Clerk to the Divisional Superintendent, Gloucester.

INDIAN RAILWAY STAFF CHANGES

Mr. A. G. T. Glaisby has been appointed to officiate as Controller of Stores, G.I.P.R., as from August 29.

Mr. E. J. H. Jacobson has been confirmed as a Divisional Superintendent, E.I.R., as from August 13.

Mr. F. J. De Souza has been appointed to officiate as Deputy Chief Engineer, N.W.R., as from August 2.

Mr. A. K. Muirhead, lately Controller of Stores, N.W.R., has been appointed to represent the Indian railways in the offices of the Adviser on Steel Supplies, and of the Iron & Steel Controller, in Calcutta.

Mr. C. E. Dickins has been appointed to officiate as Signal Engineer, E.B.R.

Mr. Phool Chand has been appointed to officiate as Deputy General Manager, Works & Secretary, E.B.R., as from August 4.

We regret to record the death last month of Mr. Basil K. Field, who was Locomotive Works Manager, London, Brighton & South Coast Railway, at the time of the railway amalgamation, and was Works Manager, Brighton, Southern Railway, until 1924.

Mr. W. J. Selley and Mr. D. M. Balfour have been appointed Directors of Balfour Beatty & Co. Ltd. Mr. H. W. Gill and Mr. A. L. Dryer have been appointed Joint Secretaries.

Mr. R. W. Higgins, who, as recorded in October 31 issue, retires from the position of Divisional Superintendent, Exeter, Great Western Railway, at the end of the year, was born in 1877 and educated at Pelham House School, Folkestone, and at Marlborough College. Mr. Higgins entered the General Manager's office, G.W.R., in 1895, and in 1917 was appointed Assistant Divisional Superintendent at Worcester. He became Superintendent of that division in 1929. He has been in charge of the Exeter Division since 1933.



Mr. R. W. Higgins
Divisional Superintendent, Exeter, G.W.R.
1933-1941

We regret to record the death on November 6 at the age of 72 of Mr. Bliss A. Bourgeois, Treasurer, Atlantic Region, Canadian National Railways, from 1927 to 1936.

Mr. H. W. Jackson, Assistant Chief Signal Engineer, South African Railways & Harbours, has been appointed Chief Signal Engineer, in succession to Mr. S. Starkey, who has retired.

Mr. P. B. Brown, Chairman & Managing Director, Hadfields Limited, invited his colleagues and their wives to a lunch at the Sheffield Club on December 13, on the occasion of the 50th anniversary of Mr. William Brown Pickering's—Director & Commercial Manager—appointment with the company. Advantage was taken of the opportunity to present Mr. Pickering with 3 sterling silver fruit dishes of Sheffield craftsmanship. Mr. W. B. Pickering was educated at King Edward VII Grammar School, Bishop Auckland, and received his early business training with his father, the late Mr. Thomas Pickering, who was Divisional Superintendent, Newcastle, North Eastern Railway. When Mr. W. B. Pickering joined the staff of Hadfields Steel Foundry Co. Ltd. (now Hadfields Limited), he was given control of the firm's traffic arrangements, transferring later to the Commercial Department. Later on he was sent to South Africa to re-organise the company's office in the Union. On his return

to Sheffield, Mr. Pickering assumed charge of the new electric-traction department. On behalf of his firm he has travelled all over the world, and has devoted much of his time to export marketing. His expert knowledge of transport matters caused him to be selected as Deputy Chairman of a local joint committee formed under the Railways Act of 1921. He is a Member of the Iron & Steel Institute, the Institute of Mining Engineers, the Light Railway & Tramway Association, and of the International Tramway Association. He is a Fellow of the Permanent Way Institution and has been Chairman also. He is a Fellow of the Institution of Locomotive Engineers, and a Member of the Sheffield Society of Engineers & Metallurgists, and is also Chairman of the General Steel Castings Association, the Steel Castings Manufacturers' Association, the Dredger Spares Export Group, a Member of the Grand Council of the Federation of British Industries, and Chairman of the Sheffield & District Branch of the Federation of British Industries.

Mr. K. M. Niall, who is a Director of the Mount Lyell Mining & Railway Co. Ltd., has been elected Chairman of the company in succession to Mr. P. C. H. Hunt, who died earlier in the year.

We regret to record the death after a long illness of Mr. W. N. Roberts, who was for many years Managing Director of J. W. Roberts Limited, asbestos manufacturer, of Armley, Leeds. Mr. Roberts made an important contribution to locomotive practice by the introduction of the Limpet asbestos mattress, which was applied to locomotive boilers over a great number of years. The passing of Mr. Roberts will be keenly regretted by a wide circle of railway friends.

Mr. Robert C. White has been appointed to succeed the late Mr. John Cannon as Chief Operating Officer of the Missouri Pacific Railroad as from October 1.

Major W. H. Power has been decorated with the Military Cross for services in the Libyan Campaign. Major Power is Mechanical Superintendent, Transportation Department, Rhodesia Railways, Bulawayo, and he proceeded on active service on the outbreak of war.

We regret to record the death, at Cockermouth on December 3, at the age of 80, of Mr. Henry Meagreen, Chairman of the Cumberland Motor Services Limited, an associate of the L.M.S.R. Mr. Meagreen was a pioneer of passenger road motor transport in Cumberland. Mr. Thomas Meagreen is Managing Director of the company, and Mr. W. H. T. Meagreen the Engineer.

Mr. Robert E. Woodruff, Co-Trustee & Chief Executive Officer of the Erie Railroad, has been elected President of the re-organised company.

Mr. Arthur E. Sylvester has been appointed Deputy Regional Fuel & Power Controller for the London region. Mr. Sylvester became General Manager of the Gas Light & Coke Company five weeks ago.

British Railways and the War—95

The ever growing numbers of tanks which are now rolling off the production lines form one of the many exceptional wartime traffics of the British railways. Left: Tanks being driven up a specially - designed "ramp" wagon at a yard on the L.M.S.R. system. The tank proceeds to its place in the tank train under its own power



The tanks in position on the train. The use of the "ramp" wagon and the fact that the tanks are driven on and off the train effects a considerable economy in time in getting them to their destinations after leaving the factory

TRANSPORT SERVICES AND THE WAR—120

Priority for sleeping berths—Christmas leave travel ban—Wartime standard buses—Winter transport of workers—Patriot movement in Yugoslavia

Since Monday last, December 15, passengers travelling on urgent Government business have first call upon all sleeping berths on the following trains:

King's Cross to Edinburgh 10.15 p.m.
King's Cross to Aberdeen 7.15 p.m.
King's Cross to Newcastle 11.15 p.m. (Sat. ex.).
King's Cross to Newcastle 10.25 p.m. (Sat. only).
Paddington to Plymouth 11.30 p.m.
Euston to Perth 7.20 p.m. (Sat. ex.).
Euston to Perth 10.55 (Sat. only).
Euston to Glasgow 9.15 (Sun. ex.).
Euston to Glasgow 9.20 (Sun. only).
Euston to Stranraer 4.50 p.m. (Sat. ex.).
Euston to Liverpool 11.45 p.m. (Sat. ex.).
Euston to Liverpool 11.35 p.m. (Sat. only).
Edinburgh to King's Cross 10 p.m.
Newcastle to King's Cross 10.45 p.m.
Aberdeen to King's Cross 6.35 p.m. (Sun. ex.).
Aberdeen to King's Cross 6.10 (Sun. only).
Plymouth to Paddington 11.30 p.m.
Perth to Euston 8.35 p.m. (Sun. ex.).
Perth to Euston 8.50 (Sun. only).
Stranraer to Euston 11.15 p.m. (Sun. ex.).
Glasgow to Euston 9.30 p.m.
Liverpool to Euston 12.3 p.m.

The Minister of War Transport, in announcing this on December 10 said, it was necessary in view of the restricted sleeping accommodation on these trains. All reservations which had been made on these trains were cancelled.

FURTHER L.N.E.R. TRAIN SERVICE ALTERATIONS

In addition to the changes on Monday, December 8, already recorded in our columns, a number of train service alterations were made in the North Eastern Area. A few trains were withdrawn, and the departure times of others were changed. Also, since that date there have been no through trains between York and Pickering via Helmsley, and passengers must change at Alne or Pilmoor.

CHRISTMAS LEAVE TRAVEL BAN

To minimise passenger rail traffic during the Christmas period, there will be no leave travel by rail for Army personnel between December 24 and 28, both dates inclusive. Exceptions to this ban on Christmas travel are leave to and from the islands around Great Britain, sick leave, and compassionate leave. Special arrangements are being made for travel to and from all parts of Ireland.

Normally, troops going on privilege leave are not permitted to begin or end that leave at weekends, but as a special Christmas

concession the War Office has decided that the weekend days December 20 and 21 may be used for the despatch of troops on privilege leave. To even the flow of traffic, and to avoid return travel on restricted days, troops going on leave on December 20, 21, and 22 are being granted 9 days' leave. No concession rate tickets will be issued for travel during the period December 24 to 28 unless it is essential for the individual to travel for compassionate reasons, in which case the leave pass will have to be endorsed. Personnel eligible for leave on short pass will not depart by rail between December 20 and 29, nor will they return by rail between December 22 and December 31.

Visits to Evacuees

The Minister of War Transport has announced that, as a further measure to restrict railway passenger travel at Christmas time, no special cheap railway facilities will be available for visits to evacuees during the period December 22 to 26, both dates inclusive. Any vouchers which may have been issued for outward journeys to reception areas during that period will not be valid.

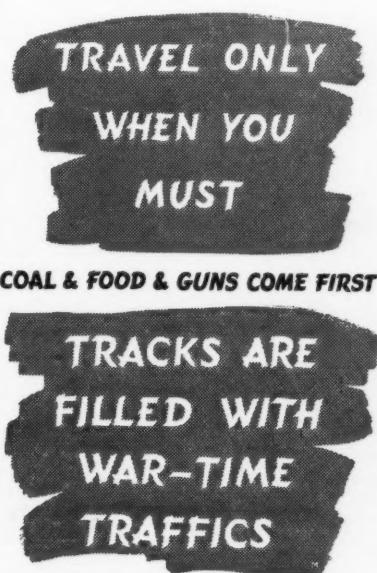
WARTIME STANDARD BUSES

A standard wartime type of four-wheel double-deck bus is being built to the instructions of the Ministry of Supply. By simplifying the design, suitable economies in labour and materials will be effected, estimated to save about 500 man hours a bus compared with the work entailed in building the average peacetime double-decker. The present programme is for a 1,000 vehicles. The chassis, all of which will be fitted with 6-cylinder diesel engines, are being supplied by Guy Motors Limited and Leyland Motors Limited, in equal numbers, and the main dimensions of the chassis have been standardised. The bodies are being built for the Ministry of Supply by a number of different body building manufacturers to a specification prepared by a joint committee representing the National Federation of Vehicle Trades, and the operating interests. Allocation of vehicles to operators is being effected through the Ministry of War Transport permit system. The bodies are of composite construction of two types, respectively the "Highbridge" seating 56 passengers (26 in the lower saloon and 30 in the upper); and the "Lowbridge" with off-side sunk gangway, seating 55 passengers (28 in the lower and 27 in the upper).

The first "standard" bus in London service was placed in



Above: A Railway Executive Committee poster exhortation to restrict Christmas-present parcels traffic, and to buy War Savings Certificates!



TRAVEL ONLY WHEN YOU MUST



Above: A new R.E.C. version of the blackout injunction

Left: Two discouragements to travel

operation on December 1, on route 22 between Putney Common and Homerton; 10 others are to follow quickly. Actually, we believe that the first complete standard-type double-deck bus, built by Leyland Motors Limited, was assigned to the Leigh (Lancashire) Corporation Transport Department, and was placed in service on October 4; two further complete vehicles were delivered to this undertaking soon afterwards.

Wide Trolleybuses for London Service

The London Passenger Transport Board is to work 43 trolleybuses under construction in this country, and originally intended for South Africa, namely 25 for Durban and 18 for Johannesburg. These vehicles are 6 in. wider than is normally permitted in Great Britain, being 8 ft. wide, and weigh one ton more; they each seat 72 passengers. The power unit is a 100 h.p. motor. The first of these vehicles went into service in the Ilford area on November 22; the second on December 6; and the third on December 15. Some illustrations are reproduced at page 657.

Winter Transport of Workpeople

With a view to mitigating some of the winter-month difficulties in the conveyance of large numbers of workpeople by road, various decisions were taken recently by the Minister of War Transport. These related to staggering of hours in industrial establishments; to hours of closing of shops, cinemas, and theatres; and to shelters for bus passengers. Where the Regional Transport Commissioner and the Regional Board of the Production Executive are satisfied as to the need for a shelter and/or queue barrier on the highway, but agreement cannot be reached for their provision, the following steps are being taken to secure their provision. The Ministry of War Transport requires the transport undertaking concerned to provide and maintain the shelter at its own expense, unless the Regional Board agrees that the shelter ought to be provided by a particular factory or factories, in which case the appropriate Government department requires the management to provide and maintain it. The local and police authorities are consulted before any steps are taken to exercise compulsory powers. The Minister of War Transport is advised that he has power, if necessary, to direct the local authority to give its consent to the erection of the shelter and to refrain from removing it. With queue barriers, the Ministry of War Transport requires the local authority (save in the London Traffic Area) to provide and maintain the barrier.

Portable Bus Queue Shelters

The urgency of providing workers with shelter while waiting for buses this winter has led the London Passenger Transport Board to make special efforts to produce more roadside shelters of the type which proved helpful last winter. Despite shortage of materials for such purposes, and of the labour for their manufacture and subsequent maintenance, a further 60 shelters are now being installed at the rate of 10 a week. The new sites include Walthamstow, Silvertown, West Ham, Brixton, Vauxhall, Moorgate, Aldgate, Hammersmith, Trafalgar Square, Whitehall, Borough High Street,



Dimension sketch of London Transport portable queue shelter unit

Clapham Common, Tooting Broadway, Knightsbridge, Camberwell, Manor House, and Grosvenor Gardens. The shelters are of standard pattern and are made in sections 10 ft. long. By this method a shelter of any size can be put together to suit traffic requirements and available pavement space. Apart from giving protection in inclement weather, the shelters have done much to encourage waiting passengers to form orderly queues.

Further Extension of Tram Crews' Licences

Under an Order made by the Minister of War Transport, which came into force on December 1, the present expiry date of every licence issued in the Metropolitan Police District to act as a driver of a tram or trolleybus, conductor of a tram or trolleybus, or driver of a taxicab is extended for a year.

British Empire Medal (Civil Division) for Railwaymen

The London Gazette of December 5 records the award of the British Empire Medal (Civil Division) to a number of railway men for brave conduct in civil defence, and Mr. Frederick Bassett, Station-master, Southern Railway, has been made an additional member of the Civil Division of the Order of the British Empire. During air attacks Mr. Bassett has shown fine leadership and outstanding courage, and his organisation of fire fighting and rescue work has assisted in minimising injury to personnel and damage to railway property.

Recipients of the British Empire Medal (Civil Division) are:—

Richard Henry Barclay, Acting Lineman, Victor George Thomas Rickman, Clerk, John Edwards Smith, Assistant Lineman, and William Waller, Station Foreman, all of the Southern Railway. During an air raid a H.E. bomb wrecked a shelter. Three members of the railway staff were killed and four badly injured. Barclay and Smith were both injured and Waller was severely shaken. Disregarding their injuries they went to the aid of the casualties trapped in the shelter. Smith rendered first aid while Barclay and Waller helped to extricate the dead and injured. Waller and Rickman organised stretcher parties and Rickman, in order to get the wounded to the street, led his party on a particularly hazardous journey across a badly damaged bridge.

Frederick John Harris, Grade I Porter, Great Western Railway. Porter Harris was in charge of a railway station on three consecutive nights during air raids. The station and surrounding area were subjected to heavy bombing. Each night Harris took charge of fire fighting and extinguished many incendiary bombs which fell around wagons containing high explosives, and in a goods shed which also contained explosives, and stocks of oil. In so doing he was in great danger, but his action saved the goods shed and station buildings, private property adjacent to the station, and the lives of civilians living in the street alongside. He disregarded the danger of time-bombs which dropped within a few yards of him and continued to combat the fire until the water supply failed. His example and leadership were an inspiration to the other men.

George Hinch, Stable Foreman, London & North Eastern Railway. During an air raid bombs fell on railway stables. Hinch, with help, succeeded in removing 19 horses although burning debris was falling from the floor of the loft and bombs were dropping nearby. Burning straw blocked the passage to 18 horses in another stable and they had to be led down a road strewn with wreckage. The horses were very excited but, in spite of the difficulties, 14 were taken to safety. It was due to the leadership, initiative, and courage of Foreman Hinch that the horses were saved.

Richard Gordon Pinn, Porter-Signalman, Southern Railway. A large number of H.E. and incendiary bombs fell on and around railway premises. A dray in a goods shed was set on fire. In the goods yard alongside there were several trucks containing ammunition, two of which were set alight, and the loaded shells exploded. Pinn, with help, hauled the dray to a hydrant and hose and eventually extinguished the fire. By his prompt action valuable property was saved.

Ernest Henry Sinden, Inspector, and Albert Victor Bentley, Station Lampman, of the Southern Railway. A large number of incendiary bombs fell on railway property and fires were started at several points. Later, a time-bomb fell close to a signal box and became welded to the live rail. The staff fighting the fires were warned that the flames might reach the bomb and that it was liable to explode at any minute, but they continued their work. Bentley and Sinden worked near to the fire only a short distance from the unexploded bomb and carried on, without relief, until the raid terminated and the fires were subdued. Both men set a sterling example to other members of the staff.

James George Thomas, Stableman, and Thomas Penwill, Temporary Carter, Great Western Railway. During an air raid Thomas and Penwill were on duty in railway stables when adjoining premises were set on fire. The two men began to transfer the 50 horses to a safer place when two high explosive bombs fell on the stables and both men were injured. After they had received first aid the two

men continued working and 22 horses were saved. The conditions under which the work was carried out were extremely dangerous.

Henry Winder, Inspector, and James Foote, Locomotive Driver, Southern Railway. During an air attack Inspector Winder, who was temporarily in charge of a railway station, took up his duties as Deputy Chief Air Raid Warden, and was ably assisted by Driver Foote. These two men worked throughout the night in difficult and dangerous conditions. They were responsible for organising the removal of engines and rolling stock from the burning station and helped to extinguish many fires. By the efforts of both men valuable property was saved.

Labels on Railway Consignments

The Ministry of War Transport and the Ministry of Supply have agreed that the use of labels on merchandise consigned for conveyance by rail in accordance with the present railway requirements is not an unnecessary use of paper and will not be regarded by the Ministry of Supply as conflicting with the provisions of Art. 8 (2) (b) (i) of the Control of Paper (No. 36) Order, 1941. Consignors of merchandise by rail should therefore continue to label their traffic in accordance with those requirements.

Armed Irish Channel Steamers

Two Irishmen were admitted to a Holyhead hospital as a result of an unusual accident aboard the L.M.S.R. steamer *Cambria* as she was crossing from Dun Laoghaire to Holyhead on December 3. A third man was also injured. The guns with which the vessel is armed have to be dismantled and taken below when she enters Irish territorial waters. It is not until she is outside the three miles limit that the guns are restored to their mountings. A gunner was carrying one of the weapons from the stern refreshment room when it accidentally fired.

The "Cambria" Attacked by Aircraft

On December 1, as the L.M.S.R. steamship *Cambria* was outward bound from Holyhead to Dun Laoghaire, a plane was observed approaching at a height of about 200 ft. The plane crossed the bow of the ship, turned, and as it came in launched a torpedo. As soon as the plane was observed, the master of the ship immediately altered course and by this prompt action the torpedo passed the stern of the ship. All guns were brought to bear on the seaplane and the last round was observed to burst very close to the machine, which rocked violently, turned, and was soon lost to sight. It did not return.

Drastic Traffic Restrictions in Germany

Drastic new traffic restrictions are reported to have come into force on the German State Railway on November 1. From that date travel is permitted for Service or professional purposes, but ordinary non-essential travel has been so severely restricted that the view is current that non-professional and private travel will be completely suspended shortly. These measures are stated to exceed in severity even the most drastic traffic restrictions in force during the 1914-1919 war. Reasons given for these new limitations are (a) additional heavy traffic in connection with the supply of potatoes, the demand for which in towns is said to have risen by some 30 per cent.; (b) shortage of domestic fuel, as stocks have not been built up during the past summer to the same extent as in the summer of 1940, due to the demands on rolling stock in connection with the invasion of Russia; and (c) coal supplies needed in order to keep the industries of the subjugated countries working in the interest of Germany. Earlier reference to the November 1 restrictions, which are stated to have included 30 per cent. cuts in passenger services, was made at page 483 of our November 7 issue.

Standardised Road Vehicles in Germany

Standardisation of motor lorries has been enforced on all German manufacturers. Vehicles of standard design for 1, $\frac{1}{2}$, 3, $\frac{1}{2}$, and 6 tons load capacity, and trailers of $1\frac{1}{2}$, 3, 5, 8 and 11 tons load capacity are made. Tractors are limited to 15, 20, 25, 30, 32, 40, 45, 50, 55, 100, 135, and 150 h.p. and are manufactured only in specially-licensed factories.

We recorded at page 248 of our September 5 issue that negotiations were in progress for the standardisation of all ordinary tramcars, and we now learn that regulations have been introduced whereby new electric street tramcars have been standardised throughout Germany. There are 210 municipalities and companies affected, operating 16,000 motorcars and 14,000 trailers, on lines of 10 different gauges ranging from 600 mm. to 1,458 mm. (approximately 1 ft. 11 $\frac{1}{2}$ in. to 4 ft. 9 $\frac{1}{2}$ in.). Only standard rolling stock may be manufactured in future. Undercarriages have been standardised in 12 different classes, six each for 4 ft. 8 $\frac{1}{2}$ in. and metre gauges, in each category three motor-

cars and three trailers, 4-wheel, 6-wheel, and bogie. The 4 and 6 wheelers have two motors each, standardised at 60 kW/600 V, or 75 kW/600 V; and the bogie cars four motors of either 50 kW/300 V, or 60 kW/300 V. Bodies have been standardised in four types, two each for motors and trailers. Large bodies, for bogie stock, have a seating capacity for 32, and standing for 44, in the motorcars; and seating for 32, and standing for 51, in the trailer. The length of body is 13.26 metres (43 ft. 6 in.). Small bodies, for 4- and 6-wheel stock, have seating for 22, and standing for 41, in the motorcars; and seating for 22, and standing for 48, in the trailers. The length of body is 10.94 metre (35 ft. 10 $\frac{1}{2}$ in.). All parts have also been standardised.

Gas Fuel in Germany

A decree of the Reichsstelle für Mineralöl (Mineral Oil Office) dated October 21, 1941, de-controlled the supply of a gaseous motor fuel known in Germany as *Treibgas* or *Flüssiggas* (liquid gas) as from that date, and *Treibgas* may now be obtained by licensed motor hauliers without any limitation. All vouchers for the purchase of *Treibgas* were thereupon cancelled. *Treibgas* is a high-quality motor fuel and is a mixture of propane and butane, both by-products of the synthetic production of petrol from coal. In fact, *Treibgas* is regarded in Germany as superior to petrol, benzol, or diesel oil. It has a very high calorific value and becomes liquid at low pressure, a fact which greatly simplifies the adaptation of motor vehicles to its use.

The fact that *Treibgas* had become de-controlled was hailed in the German press as evidence of great progress in the supply of motor fuel. For example, commenting on the new regulation, the *Deutsche Allgemeine Zeitung* of October 22 said that the abolition of rationing for fuel gas suggested that the manufacture of synthetic oil was increasing. This paper emphasised, however, that the free sale of fuel gas did not apply to owners of vehicles who had not previously held vouchers. Private cars are not allowed any *Treibgas*, and no licences for the adaptation of private cars for use of this fuel are issued.

Final instructions have been issued to all owners of lorries with a carrying capacity of more than one ton, and of buses and tractors, except those used in agriculture, to adjust their vehicles to the use of *Flüssiggas*, provided that a gas station exists within 10 km. (6 miles) of their garage and that they have been using more than 150 litres of petrol a month. Actually, the underlying reason for the de-control is believed to be the fact that *Treibgas* is very difficult to store and therefore measures had to be devised to ensure the current, rapid, and easy sale of this fuel in preference to all other types of motor fuel. The extension of storage facilities for *Treibgas* is said to be hampered by lack of suitable types of steel. As only lorries adapted to the use of this special fuel are to be supplied, the partial de-control should encourage the rapid conversion of more vehicles.

German-Italian Goods Traffic through Jugoslavia

On November 1 goods traffic was resumed on the Jesenice-Trieste line, which was heavily damaged by the Jugoslav forces in April last. As heretofore, the Italian frontier station is at Podbrdo (Piedicole), 112 km. (69 $\frac{1}{2}$ miles) to the north of Trieste; Germany is in occupation of the Jugoslav territory to the north of Podbrdo. The former Jugoslav frontier station Bistrica Bohinsko Jezero, 8 km. (5 miles) to the north of Podbrdo has been named Feistritz-Wocheinsee by the Germans. The Jugoslav section of this line from that frontier station to Jesenice (now called Assling)—the former Jugoslav-German frontier station—is 31 km. (19 miles) long.

Transport in Jugoslavia

Through goods traffic between Germany and Croat, Serbian, and Bulgarian stations in wagon loads and smaller consignments was resumed in October. One route only is available, namely, that via Spielfeld-Stras, Zidani-Most, Dobova (the present Croat-Reich frontier station), Zemun, Belgrade, Nish, and Bela-Palanka.

Belgrade harbour extensions which were under construction at the time of the German invasion, have been resumed by German orders, and materials required are being supplied by Germany. A length of over 1,000 metres (1,094 yd.) of new quays on the right bank of the River Sava, with warehouses and railway sidings along the quayside and on both sides of the warehouses, travelling cranes, and other equipment, are now stated to be in use.

In our notes on Montenegro, published in THE RAILWAY GAZETTE of October 17, page 393, mention was made of the Bileca-Niksic section, and it was stated that no construction work had been begun. This section, an extension of the narrow gauge Hum to Bileca line, had been in operation from 1939 up to a few days after the German onslaught on Jugoslavia, when it was severely damaged. It should be made clear that the report that no work has been begun refers to reconstruction, which apparently is being held up because of guerilla activities still continuing in that district. The

December 19 & 26, 1941

section, which has a gauge of 2 ft. 6 in., is 72 km. (45 miles) long, and is single track. It serves 6 intermediate stations in addition to the new terminus of Niksic. Whether arrangements have been made for its operation in the partition scheme of Jugoslavia is not known.

Patriot Movement Spreading in Jugoslavia

According to a report from Serbia, an order issued by the German occupation authorities on November 13, 1941, required the removal of all trees, scrub, and bushes on both sides of the more important railway lines. The width of the zones thus to be cleared is to extend to 500 metres (1,640 ft.) on each side of the line; the work is to be completed by the end of February, 1942. The object of this measure is to make the railway zones less vulnerable to attack by Patriot Forces operating against railway lines and communications, in much the same way that early English road Acts were designed primarily to require a clearing on each side as a protection against highway robbers. Attacks on railway lines by Jugoslav Patriot Forces have been intensified recently, and a report from Serbia of the same date at that recording the above-mentioned order stated that the Patriot Forces had destroyed nearly all the bridges and damaged all main railway lines in Serbia which then remained in working order, thus causing widespread dislocation not only of the railway services but of a variety of other public facilities including the postal and telegraph services; both the latter are said to have been suspended altogether.

The standard-gauge railway branching off at Nish from the Belgrade-Sofia main line and leading northwards to the Danube port of Prahovo, a distance of 194 km. (120 miles) was recently blown up by Serbian Patriots between Zajegar and Palilula stations 113 km. and 49 km. (70 and 30 miles) respectively from Nish. All traffic had to be discontinued over this length 64 km. (40 miles). The railway line runs partly along the Jugoslav-Bulgarian frontier through the Timok Valley and was to have been the northernmost section of the Danube-Adriatic railway line.

At Metovnica, 15 km. (9 miles) to the west of Zajegar on the

narrow-gauge (2 ft. 6 in.) line leading westwards to Paračin on the Nish-Belgrade main line, a branch line (of the same narrow-gauge type) leads northwards to Bor, the most important copper mining centre in Europe; this mining industry passed from French ownership into German control early in 1941.

Vienna Bus Services

The *Neues Wiener Tagblatt* recently announced the discontinuance from October 20 of two further Vienna bus services. Precise information is lacking about previous withdrawals, but it seems that the Vienna motorbus system has been curtailed drastically within recent months.

Road Transport Monopoly in Greece

According to news from Athens, negotiations are in progress at present between representatives of the Greek Ministry of Supply and the Greek Ministry of Communications, and representatives of the German and Italian occupation authorities, with a view to founding a monopoly concern for the operation of road motor transport services all over Greece.

Producer Gas Fuel

The Secretary for Mines has invited the Henley Committee, which last year reported on low temperature carbonisation processes, to re-assemble and examine the sources of producer-gas fuels, to estimate the quantities which could be made available immediately, and to report on measures which would increase the supplies. Included in the committee is Mr. J. Shearman, Road Motor Engineer of the L.M.S.R.

Locomotives Converted to Oil-Burning in Egypt

In order to reduce coal consumption and freights, the Egyptian State Railways are to convert 136 locomotives from coal to oil burning. Of these 30 have already been converted.

Producer Gas Discussed in the Lords

The Duke of Montrose in the House of Lords on December 9 moved "That in connection with the Government scheme for controlling road transport, and in view of a prospective further reduction in petrol supply, this House is of opinion that the time has arrived for developing the use of producer gas as an alternative system of propulsion for haulage." He said that as an island nation we produced no oil in this country, and there could be no question that if our sources of supply of the necessary oil shrank we should be in a serious position. He felt that the alternative system that we should seek to initiate and develop was that of producer gas. We had in this country ample sources from which to develop the producer gas system for motor propulsion. Producer gas had been in use on the Continent for many years. They tried to develop this form of power by giving subsidies and grants, while in this country the Government tried to suppress it by means of additional taxation. He would like to see the Minister of War Transport set up a separate department in his Ministry to go into this question of an alternative motive power to take the place of petrol.

Lord Davies said that as long ago as 1938 Italy had 5,000 passenger vehicles and 1,000 lorries equipped with gas producers, and the Italian Government paid two-thirds of the cost of conversion. In France in 1938 there were 6,000 vehicles run on producer gas, and the Government exempted those vehicles from taxation for two years. In Sweden there were 2,000 buses, 14,000 lorries, and 6,000 other vehicles run on producer gas, and there was a rebate of 50 per cent. in the tax imposed on petrol run vehicles in the case of vehicles run on producer gas. Even in Switzerland the Government had given a subsidy in order to provide 1,000 vehicles run on producer gas. As far back as 1937, 2,000 vehicles had been

adapted in Germany for running on producer gas, and today there were 180,000 lorries and 66 inland waterway vessels which were run on producer gas. He understood that meant a saving of 680,000 tons of oil this year, and it was anticipated that next year the saving would be as much as 1,000,000 tons of oil. That showed that at any rate it was a feasible proposition. In this country there were fewer than 1,000 vehicles being run on producer gas even after two years of war.

Viscount Plumer said that the commercial users were perfectly willing to try out gas producers, but they had found that the relaxation of taxation which they were offered in 1940 was not sufficient to cover the prime costs of having gas producers, and, secondly, there was another very large cost for the maintenance and renewal of certain parts of the gas producer. There was also great difficulty in procuring the proper fuel. If it was essential that commercial users should be encouraged to use gas-producer plant certain concessions as regarded taxation should be made in order to make it worth while for them to use it.

Lord Templemore said that the Government had done a great deal during the last few years. The Hartley Committee in 1940 published designs for a Government emergency producer which had proved satisfactory under working conditions in commercial service. Further improvements had been made since that date, and had been tested in operation by the road transport organisations represented on the Mines Department's Committee. Research work had been continued by the Fuel Research Station, the British Coal Utilisation Research Association, and other organisations. During the past few months progress had been rapid, and it had been possible to arrange tests of new types of producers and filters on vehicles engaged in long-distance

transport. The Government had encouraged this kind of locomotion by modifying various regulations that operated to the disadvantage of vehicles using producer gas. The Government expected that as a result of the concessions made there would be a great increase in gas driven vehicles, but the contrary was the case. The chief reasons for that were undoubtedly, first, the loss of power hitherto inseparable from conversion to producer gas; secondly, the increase in operating costs; and, thirdly, the fact that, although the strictest economies were enforced in the issue of liquid fuel, it had up to the present been found possible to meet the needs of all essential transport from that source. A further check on the extensive use of producer gas was the limited supply of fuel which was suitable. A committee had been set up under the chairmanship of Lord Henley to examine the measures which would be required to increase supplies. The report of that committee would be examined with great care to see what might be the scope for further development from the fuel point of view. Whatever might be the technical possibilities, the ultimate decision as to the extent to which it might be possible or desirable to extend the use of producer gas must depend upon the relative availability of coal and oil supplies, and on the possibility of diverting from other purposes the large amounts of steel and labour required for the manufacture of producer gas plant.

The Duke of Montrose said he knew that two 31-seat buses were running today on roads in the Highlands, and that they had already covered 156,000 miles, on producer gas. The experience gained with them indicated that the cost of fuel was 59 per cent. cheaper than petrol. Did Lord Templemore actually believe that a commercial firm would not favour changing vehicles over to producer gas propulsion and saving 59 per cent. on the cost of fuel?

British Railway Stockholders' Union Annual Meeting

The annual meeting of the British Railway Stockholders' Union was held at Caxton Hall, Westminster, S.W.1, on December 12. Sir Charles Stuart-Williams, Chairman of the Union, said that the terms of the financial agreement with the Government did not err on the side of generosity, as they prevented stockholders from enjoying the fruits of efforts made during the period of economic depression to conserve and improve railway equipment and the present was the first opportunity for reaping such benefits which had occurred for 11 or 12 years.

It had to be remembered that the increase of the Excess Profit Tax from 60 to 100 per cent. meant that the State became in effect the sole owners of the equity of all such companies and the erstwhile ordinary shareholders became, in effect, second preference shareholders. They

were entitled to a certain fixed revenue though no longer able to share in any prosperity the company might enjoy, though not deprived of the liability to share in any reverse of fortune. The refusal of the Government to admit the cost of war risk insurance as working costs actually depleted the dividend fund, although that fund was already restricted until it represented in many cases only a fraction of trading profits. These facts should be recognised, if only to counter the many prejudiced and ill-informed statements by critics of the railways.

Great uncertainty still existed as to the effect of the new liability for 50 per cent. of war damage, which now fell on the railway dividend fund. As compared with the first agreement there would seem to be a "cushion" of some £2½ millions to meet the liability, but neither the amount

of damage already incurred nor what the future may bring forth was known, and no one would be so foolish as to ignore or underestimate the risk of further heavy charges in this connection. Again, even if the original cost of destroyed works and rolling stock was known, that figure would not give the cost of replacing them during a period of possibly much higher costs; even if the percentage of higher costs was known, it was not clear how that percentage would be handled by the accountants and auditors.

On the other hand, stockholders could not ignore the comparatively favourable position of the railways in their possession of highly trained and well equipped departments for maintenance work of all kinds, or the possibility, clearly recognised by Government, that war damage could be funded and amortised over a period of years, so that the crushing burden of a heavy and unusual liability on one or two years' revenue might be avoided.

Institute of Transport Luncheon

Mr. Harold E. Clay, Assistant General Secretary to the Transport & General Workers' Union, was the chief guest at a luncheon given by the Institute of Transport at the Connaught Rooms, London, W.C., on December 10. Mr. J. S. Nicholl, C.B.E., President of the institute, was in the chair.

Mr. Clay emphasised that it was becoming increasingly essential not only that there should be the best use of all transport facilities, but that to obtain this the utmost co-operation must be secured between those who used transport and those who provided the facilities. Substantial changes had taken place in recent months, but he doubted if transport was yet effectively organised for war purposes. He thought that further changes would have to be made either at the instance of the institute, or at the behest of the Ministry of War Transport. At the moment factory hours were decided without due consideration being given to the plans and facilities of the transport industry. Staggering of hours was one means of helping both parties, but it was not a panacea unless it was related to a given route, a given factory, and a given group of vehicles. Many advantages were to be gained by a consultation between all parties concerned, and among these were that plans could be devised whereby the waiting time for vehicles could be reduced, the overall time of transport cut down, and more vehicles made available for use over the day.

Mr. Clay declared that it was necessary to state clearly that if more labour was taken from the transport industry, then transport could not do the job that it had been called upon to do. It might be necessary, he agreed, to take more labour from it, but it was as well that it should be recognised that if that was done what the effect would be.

Among those present were : Messrs. A. W. Arthurton, F. G. Bristow, G. H. Brooks, M. A. Cameron (Member of Council), R. Carpmael (Member of Council), A. Chouffot, Harold E. Clay, H. M. Cleminson (Vice President), B. W. C. Cooke, F. W. Crews, J. A. Dunnage, Evan Evans, N. D. Fawker, S. R. Geary, H. C. Godsmark, P. E. R. Graef (Member of Council), A. H. Hawkins, Sir Maxwell Hicks, Messrs. T. Graham Homer, H. T. Hutchings, C. Johnstone, J. A. Kay, C. E. Klapper, Brig.-General Sir Osborne Mance, Messrs. F. A. A. Menzler, J. S. Nicholl (President), J. B. Osler (Member of Council), A. Packham, E. E. Painter, J. Pater-

son, W. M. Perts, J. Pike, J. S. F. Pollitzer, H. G. N. Read, C. J. Selway (Member of Council), H. W. Smither, Capt. F. G. Spriddell (Member of Council), Messrs. T. Tilston, T. E. Thomas (Past President), H. N. Trye, A. B. Valentine, Alex. J. Webb, and C. M. Wentworth.

L.M.S.R. VAULTS YIELD 50 TONS OF PAPER

A special search of vaults and cupboards at Derby railway offices, L.M.S.R., has yielded 50 tons of paper.

Among the documents brought to light are registers of drivers and firemen as far back as 1881, tissue copying books dated 1858, minutes of meetings written in "copper-plate" handwriting, records of blizzards and gales for the last sixty years.

Questions in Parliament

Nigerian Railway Workers

It is understood that representations on behalf of the African staff of the Nigerian Civil Service, including the railway staff, have been made to the Government of Nigeria. Many improvements in the conditions of service of railway workers were introduced with effect from October 1 and the Secretary of State for the Colonies has been in communication with the Governor of Nigeria as to possible improvements in the salary scale in the general clerical and technical services. Apart from the question of these improvements, the Governor has appointed a special committee to consider the adequacy of rates of pay of labour, and of African Government servants and employees in the township of Lagos, having regard to any increase in cost of living which may have occurred since the outbreak of war, and to make recommendations as follows : (a) Whether a temporary increase by way of bonus or other addition to pay should be made. (b) Whether any form of relief is desirable, such as, for

example, (1) free meals at work ; (2) provision of good and cheap meals on purchase ; (3) stricter price control ; (4) rent restriction ; (5) provision of quarters or assisted schemes for tenements. Provisional wages committees also have been requested to submit recommendations as to whether existing minimum rates of pay should be raised. (Mr. George Hall, Under Secretary of State for the Colonies, December 3.)

Nigerian Railway Dispute

There was no lock-out of the Nigerian railwaymen in the technical sense, but owing to a misunderstanding of instructions by a subordinate official, the gates of the railway workshop were not opened on the morning of September 29 until about half-an-hour after the usual time. Earlier in the year the Railway Workers' Union made certain requests to the railway administration for improvements in their terms of service. The decision of the Nigerian Government on those requests was conveyed to the union on May 6 and was well received. There was, however, delay in the preparation by the railway administration of a detailed explanatory statement of the Government's scheme. Nevertheless that statement was, in fact, sent to the union a week before the scheme was due to become operative. The detailed decisions were rejected, primarily because they were not understood. At a mass meeting of all employees on September 29, the improvements were carefully explained by the Governor, and work was resumed in full on September 30. An explanatory statement by Government was issued to the men on October 4. The revised terms of service, which have been received with much satisfaction, include the refund of loss of pay occasioned by the conversion in 1931 from daily to hourly rates of pay, the abolition of the hourly rate of pay, pay for public holidays, the normal working week to be 45 hr—8 hr. on each ordinary day and 5 hr. on Saturday, overtime at time and a quarter rates in accordance with the approved practice for the railway, arrangements for the appointment to the fixed establishment of the railway of skilled workmen in trades to which apprenticeship is normally served, and improved conditions for apprentices. A special enquiry was held by the Attorney-General of Nigeria into the incident on September 29. The Attorney-General reached the conclusion that no disciplinary action was called for in the case of any of the officials concerned. The Governor is in agreement

with the Attorney-General's conclusion and the Secretary of State for the Colonies accepts the Governor's view. (Mr. George Hall, Under Secretary of State for the Colonies, December 10.)

London Suburban Services

The proposed cuts in train services will not apply to the suburban services to the east of London. I regret that I cannot give any undertaking that these services will be increased. (Colonel J. J. Llewellyn, Joint Parliamentary Secretary, Ministry of War Transport, December 10.)

War Risks Insurance

The terms of the War Risks Insurance Act, 1939, as amended by the War Damage Act, 1940, exclude the loss of perishable goods through railway companies not sheeting traffic from being brought within the scope of the War Risks Commodity Insurance Scheme. At one time the Ministry had prohibited double sheets because of the shortage of tarpaulin, but the Sheetings of Traffic Order had been annulled; there was a greater supply of tarpaulin. (Colonel J. J. Llewellyn, December 10.)

New Buses

Limited numbers of new buses are in the course of production and delivery. They are allocated to operators, municipal and other, according to the needs of transport. The provisional allocations for the Metropolitan Region and for the five Midland and Northern Regions of England, taken together, are approximately in the ratio of one to three. The allocations may be varied in the light of changing circumstances. (Colonel J. J. Llewellyn, December 10.)

Railway Paper Salvage



L.M.S.R. goods station decks and warehouse floors are swept at intervals daily and the collection bagged

Notes and News

Canadian Express Derailed.—A Toronto-Ottawa express was derailed just outside Ottawa station on December 2. The engine driver was killed and 30 passengers were injured.

Cost of Air Conditioning.—The cost of air-conditioning a railway passenger carriage in the U.S.A. varies between \$4,000 and \$8,500, according to the type of equipment that is installed.

The Bengal & Assam (State) Railway.—A notification dated August 25, 1941, in *The Gazette of India* states that the railway systems now known as the Assam-Bengal and the Eastern Bengal Railways, will be combined with effect from January 1, 1942, and known as the Bengal & Assam Railway.

Christmas Trees at L.N.E.R. Stations.—Seven large north country stations, York, Hull, Scarborough, Harrogate, Darlington, Newcastle, and Tynemouth, are again being decorated with Christmas trees illuminated as much as the lighting restrictions will allow. These trees will be loaded with gifts for distribution to the sick, the needy, and the children in the local hospitals.

Great Southern Railways (Eire).—For the 48th week of 1941 the Great Southern Railways Company reports passenger receipts of £36,214 (against £32,401), and goods receipts of £86,770 (against £67,762), making a total of £122,984, against £100,163 for the corresponding period of the previous year. The aggregate receipts to date are passenger £1,908,965 (against £1,688,670), goods £2,673,091 (against £2,360,199), making a total of £4,582,056 (against £4,048,869).

Passenger Fares.—In an article on "The Basis of Passenger Fares" in our issue of November 28, it was inadvertently stated that "much higher cost of working during the present war has led to a general increase of 16% per cent. in fares, season tickets, and workmen's tickets." Actually, of course, season tickets and workmen's tickets have not been increased by more than 10 per cent. as the 6d per cent. increase from December 1, 1940, did not apply to these classes of tickets.

Great Northern Railway (Ireland) Wages.—Reference was made in our issue of November 28, at page 551, to the anomaly in wages on the Irish railways resulting from the decision of the Northern Counties Committee of the L.M.S.R. to increase the war bonus payable to its workers by 2s. 6d. a week for adults, and 1s. 3d. a week for juniors as from August 1. The Great Northern Railway was willing to follow the example of the L.M.S.R., but was estopped by the Eire Government's Order No. 83 from increasing the remuneration of its workers in the southern area. Order No. 83 has now been amended to permit the G.N.R. to make the bonus payment.

Accident Damages Reduced.—On a reclaiming motion by the L.M.S.R. Co., the Second Division of the Court of Session on November 26 varied an award made by Lord Patrick against the company in August last. Lord Patrick had found that the company was liable for the death of Mr. W. G. Paterson, an iron turner, who was fatally injured on a dark night in November, 1940, by a railway wagon and engine at an industrial level crossing in

Glasgow, where there were no gates. The widow, two daughters, and a son had claimed compensation totalling £4,150, and Lord Patrick awarded them a total of £3,300. The Second Division, while upholding the judgment of Lord Patrick as to the liability of the company, reduced the total award to £1,825.

Derailment in Northern Ireland.—The accident (recorded on page 600 of our December 5 issue) at New Forge, near Lisburn, Co. Antrim, on November 25, when 18 of 33 laden wagons were

British and Irish Railway Stocks and Shares

Stocks	Highest 1940	Lowest 1940	Prices	
			Dec. 12, 1941	Rise/ Fall
G.W.R.				
Cens. Ord.	52	22½	41	- 2½
5% Con. Pref.	103	58	107½	-
5% Red. Pref. (1950)	105	98	104	+ -
4% Deb.	107	90	111½	- 2½
4½% Deb.	108	96	113	-
4½% Deb.	144	96	139	+ -
5% Deb.	124	106	130	-
2½% Deb.	66	57	68	-
3% Rt. Charge	117	97	127	-
5% Cons. Guar.	117	90	126	+ 1
L.M.S.R.				
Ord.	242	9	161	- 3
4% Pref. (1923)	60	21	49	- 2
4% Pref.	70	35	65	-
5% Red. Pref. (1955)	94	60	94	+ -
4% Deb.	101	81	102	-
5% Red. Deb. (1952)	109	102	109	-
4% Deb.	93	65	97	- 2
L.N.E.R.				
5% Pref. Ord.	8	11	32	-
Def. Ord.	48	14	48	-
4% First Pref.	60	20	48	- 3
4% Second Pref.	22	6	18	-
4% Deb. (1955)	80	34	76	-
4% First Guar.	86	54	87	- 1
4% Second Guar.	77	37	77	-
4% Dab.	73	54	75	- 1
4% Deb.	97	74	100*	- 3
5% Red. Deb. (1947)	107	96	104	+ -
4% Sinking Fund	104	98	101½	-
Red. Deb.				
SOUTHERN				
Pref. Ord.	79	34	63	- 1½
Def. Ord.	7	14	14	-
4% Pref.	22	58	105	- 4
5% Red. Pref. (1964)	104	85	104	-
5% Guar. Pref.	116	90	126	-
5% Red. Guar. Pref.	114	94	113	-
(4%) Deb.	106	84	108*	- 2
3% Deb.	122	100	128*	-
4% Red. Deb. (1962-67)	106	96	107*	-
4% Red. Deb. (1970-80)	106	93	107*	-
FORTH BRIDGE				
4% Deb.	95	87	97	+ 1
4% Guar.	93	81	97	-
L.P.T.B.				
4½% "A"	116	103	116	-
3½% "A"	121	107	127	-
4½% "T.F.A."	105	101	104	-
5% "B"	116	102	114	+ 1
"C"	65	24	41	+ 1
MERSEY				
Ord.	26	18½	22½	+ 2
4% Perp. Deb.	92	84	99	-
3% Perp. Deb.	68	63	72	-
3% Perp. Pref.	57	50	56	-
IRELAND BELFAST & C.O.				
Ord.	4	3	4	-
G. NORTHERN				
Ord.	4½	1½	14	-
G. SOUTHERN				
Ord.	12½	4	14	- ½
Pref.	15½	6	15	+ 1
Guar.	36	15	44	+ 1
Deb.	55	40	61	+ 1½

*ex dividend

OFFICIAL NOTICES

The Sheffield & District Gas Company

APPICATIONS are invited for the post of Traffic Superintendent to the above Company.

The salary will be from £400 to £500 per annum, according to experience and qualifications. The Superintendent's duties will be to control the operation of the Company's Road Transport vehicles and be responsible for the maintenance and repair of same.

Candidates must have had considerable practical experience in the repair and maintenance of all types of motor vehicles, both heavy and light, and also have had experience in the control of men.

Applicants are requested to state their age and give full details of their experience. They must also be prepared to submit to a medical examination.

Applications to be addressed to the undersigned, enclosing copies of recent testimonials, and delivered at that office not later than December 31st, 1941.

R. HALKETT, Junr.,
Secretary & Assistant General Manager,
The Sheffield & District Gas Co.,
Commercial Street,
Sheffield.

Sudan Government

SUDAN RAILWAYS require the services of FIVE TRAFFIC INSPECTORS, age 24-27 years, unmarried. Candidates must have several years experience in the traffic clerical side of a Railway in England, with experience in Goods and Traffic station working including Block working and Railway Signalling. Preference will be given to candidates holding railway extension course certificates and with knowledge of shorthand and typing.

Starting rate of pay £E.300-324 per annum (£E.1 = £1 0s. 6d.) according to age and qualifications, with periodical increases in accordance with Government Scales, viz., £E.300-324-360-396-432-480-540-600, the first four increases being biennial and after that triennial.

Successful candidates will be appointed on Probationary Contract for 5 years and subscribe to the Provident Fund, after which if not accepted to pension they will be paid a bonus equivalent to 20 per cent. of the pay drawn between the date of their retirement and the completion of two years' service. Free passage on appointment. Strict medical examination.

Applications, giving full particulars as regards age, qualifications and experience, together with copies of testimonials, should be sent to the Controller, Sudan Government London Office, Wellington House, Buckingham Gate, London, S.W.1, marking envelope "Traffic Inspector."

Sudan Government

SUDAN RAILWAYS require the services of TWO LOCOMOTIVE FOREMEN, aged 25-45 years, preferably unmarried. Candidates should have served apprenticeship as fitters in Railway Locomotive Works and have had subsequent running shed experience.

Starting rate of pay according to age and qualifications in scale £E.324-360-396-432-480-540-600 (maximum). Increases in salary are biennial up to £E.432 then triennial up to maximum of £E.600. (£E.1 = £1 0s. 6d.).

Successful candidate will be appointed on probationary contract for 5 years and subscribe to the Provident Fund, after which if not accepted to pension he will be paid a bonus equivalent to 20 per cent. of the pay drawn between the date of his retirement and the completion of two years' service. Free passage on appointment. Strict medical examination.

Applications, giving full particulars as regards age, qualifications and experience, together with copies of testimonials, should be sent to the Controller, Sudan Government London Office, Wellington House, Buckingham Gate, London, S.W.1, marking envelope "Locomotive Foreman."

Sudan Government

SUDAN RAILWAYS require the services of THREE DISTRICT TRAFFIC MANAGERS, not over 26 years of age, preferably unmarried. Candidates must be holding a University Degree, and have had training in traffic working on an English or Overseas Railway.

Starting rate of pay £E.480 per annum (£E.1 = £1 0s. 6d.), with periodical increases in accordance with Government Scales, viz., £E.480-540-600-660-720-880-936, all increases being biennial with the exception of the last increase which is triennial.

Successful candidate will be appointed on Probationary Contract for two years and subscribe to the Provident Fund, after which if accepted to serve towards pension his contributions will be transferred to the Pension Fund.

Free passage on appointment. Strict medical examination.

Applications, giving full particulars as regards age, qualifications and experience, together with copies of testimonials should be sent to the Controller, Sudan Government London Office, Wellington House, Buckingham Gate, London, S.W.1, marking envelope "District Traffic Manager."

Canadian National Railway Company

WELLINGTON GREY & BRUCE RAILWAY COMPANY, 7 PER CENT. BONDS.

At the semi-annual ballot for November, 1941, the following Wellington Grey & Bruce Railway Company 7 per cent. Bonds were drawn and will be paid at par at the offices of the Canadian National Railway Company in Montreal, Canada, or at Orient House, 42/5, New Broad Street, London, E.C.2, England, on and after the 1st January, 1942, that is to say, Bonds numbered — 334, 428, 542, 543, 709, 904, 995, 1016, 1345, 1422, 1433, 1527, 1729, 2001, 2044, 2166, 2331, 2364, 2379, 2417, 2461, 2571, 2594, 2693, 2717, 2779, 2874, 2978, 3014, 3056, 3178, 3261, 3342, 3462, 3488, 3531, 3571, 3616, 3728, 3733, 3782, 4024, 4041, 4064, 4097, 4228, 4361, 4364, 4417, 4460, 4483, 4486, 4498, 4518, 4611, 4625, 4671, 4682, 4687, 4734, 4742, 4820, 4825, 4867, 4993, 5010, 5052, 5096, 5138, 5216, 5238, 5241.

In all £7,200 sterling.

Holders of these Bonds will take notice that the interest will cease after 1st January, 1942.

A. H. CONEYBEARE,
European Secretary & Treasurer.
London, 13th December, 1941.

Canadian National Railway Company

WELLINGTON GREY & BRUCE RAILWAY COMPANY, 7 PER CENT. BONDS.

NOTICE IS HEREBY GIVEN that the estimated earnings of the Wellington Grey & Bruce Railway Company for the half-year ending 31st December, 1941, applicable to meet interest on the above Bonds, will admit of the payment of £5 2s. 7d. per £100 Bond, and that this payment will be applied as follows, viz.:

£0 8s. 9d., balance due for Coupon No. 120, due 1st July, 1930;

£3 10s. 0d. in full payment of Coupon No. 121, due 1st January, 1931; and

£1 3s. 10d., on account of Coupon No. 122 due 1st July, 1931,

and will be made on and after 1st January, 1942, at the offices of the Canadian National Railway Company, Orient House, 42/5, New Broad Street, London, E.C.2, England.

The coupons must be left three clear days for examination.

A. H. CONEYBEARE,
European Secretary & Treasurer.
London, 13th December, 1941.

wrecked, was the subject of an inquiry in Belfast, on December 11, by Mr. R. D. Duncan, Inspector of Railways, Northern Ireland Ministry of Home Affairs. Evidence was given that the mishap was due to a fracture of a drawbar coupling. Mr. Hugh McIntosh, Mechanical Engineer, said he believed that when the train was starting from Hillsborough it divided. The back part ran down a gradient of 1 in 62 and caught up on front part and the collision took place after the front part had been brought to a standstill at New Forge. The findings of the Ministry will be announced later.

Sino-Indian Line being Surveyed.—A Reuters message from Jorhat, in Assam, states that a Chinese railway survey party, which has been surveying a line from China to a point on the River Brahmaputra opposite Sadiya, has been in Jorhat for some little time, presumably preparing its drawings and estimates in recess. The line surveyed would appear to be an alternative to the Burma-Yunnan railway, and to join up with the Free Chinese railway system at some point in Szechwan Province. With a train ferry at Sadiya, through running from China over the Dibrugarh-Sadiya, Assam-Bengal, Eastern Bengal, and other metre-gauge Indian railways would be possible, assuming that, like the Burma-Yunnan line, the Chinese section would be of that gauge. According to the message the surveyors state that only small ranges of mountains were encountered, and that it should be possible to build the line within a period of two years. It would prove a valuable and comparatively safe life-line for China.

Railway and other Reports

Lincolnshire Road Car Co. Ltd.—For the year to September 30, 1941, the revenue of this company, which is controlled jointly by the L.M.S. and L.N.E.R. Railway Companies and Tilling & British Automobile Traction Limited, was £340,117, after providing for taxation (including estimated provision for E.P.T.). This compares with £326,973 for 1939-40. After providing £234,423 for operating, maintenance and administration expenses, £41,946 (£37,117) for fuel tax and road vehicle duty, £1,700 (same) for directors' fees, and £34,120 (£29,314) for depreciation and renewals, there is a balance of £27,928 (£47,369), which, added to £11,754 brought forward, makes a total of £39,682. General reserve receives £8,500 (£30,000), and the dividend is again 10 per cent., leaving £11,182 to be carried forward. A number of vehicles has been hired to the military authorities and 9 vehicles have been acquired by the Government during the year.

East Kent Road Car Co. Ltd.—This subsidiary of the Southern Railway Company and of Tilling & British Automobile Traction Limited reports, for the year to September 30, 1941, traffic receipts and other income amounting to £672,943 (£525,816). After providing for expenses £338,582 (£326,618), duties, taxes, etc. £149,637 (£72,789), depreciation and renewals £80,000 (£98,000), and other items, there remains a net profit of £98,216 (£22,248). General reserve gets £10,000 (same), and preference dividend again takes £13,000. Dividend on the ordinary shares

is 8 per cent. (nil) and requires £36,000. Contrary to expectations the profits are substantial. The liability in respect of E.P.T. is reduced by reason of the deficiency brought forward, but like circumstances will not apply to the ensuing year.

United Automobile Services Limited.—This company, a subsidiary of the L.N.E.R. and Tilling & British Automobile Traction Limited, received in the year to September 30, 1941, traffic receipts and other income, less expenses and depreciation, of £993,006 (£681,084). Income tax and E.P.T. took £601,509, fuel duty and road licences £160,846, contingencies £50,000 (nil), and directors' fees £2,450 (same), leaving a net balance of £178,181 (£175,267). The ordinary dividend is 9 per cent. tax free (same), and the carry forward is £69,042 (£47,812).

Contracts and Tenders

The U.S.A. locomotive industry produced more than 800 units in the first nine months of 1941, a figure which has not been equalled in any 12-month period for the last 12 years, according to the Department of Commerce. September shipments amounted to 81 units, but it is estimated that locomotive output could be doubled, as shipments were less than half production capacity. The low ratio of shipments to capacity is attributed in part to the diversion of raw materials to the manufacture of defence products.

Stewarts and Lloyds Limited has removed from Shell-Mex House to Brook House, Upper Brook Street, W.1 (Tel. Mayfair 9861).

Railway Stock Market

Following the widespread set-back in security values last week when the war news had an adverse influence on sentiment, steady and improving conditions have developed in Stock Exchange markets. The continued absence of any heavy selling was a helpful factor, and the volume of business showed some improvement from the sharp contraction in evidence a week ago. In many directions, the reduced prices attracted buyers, but in most instances only part of last week's decline has been regained. A favourable influence was provided by the steady undertone maintained in British Funds, although it is realised that for the time being markets generally are likely to continue to be governed mainly by the nature of the war news. In accordance with the prevailing trend, home railway stocks were lower on balance, but sentiment continued to benefit from hopeful views as to the dividend outlook, and in some instances prices regained a considerable part of the sharp decline shown towards the end of last week. Absence of heavy air raid damage in the current year, and the assumption in the market that the charge in respect of war damage is likely to be spread over a long period of years, have maintained hopes of slightly better dividends for 1941 on some of the junior securities. In view of the substantial yields indicated at current

prices, there is widespread belief that the junior stocks are moderately priced. Consequently, they may come in for increasing attention between now and the dividend announcements, expected on February 20, although much may, of course, depend on the general market trend and that of the war news.

In common with most other groups of securities, home railway stocks have shown substantial improvement in price since the beginning of the year, when there was considerable uncertainty as to the basis on which the financial agreement with the Government was likely to be revised. The following table gives prices ruling at the beginning of January, together with current prices and approximate yields :—

	Early 1941	End 1941	Yield %
Gt. Western ord.	32	42	9
5 per cent. pref.	84	107	4
L.M.S.R. ord.	13	16	8
4 per cent. pref.	51	66	6
4 per cent. 1923 pref.	37	50	8
L.N.E.R. 4 per cent. 1st pref.	33	49	8
4 per cent. 2nd pref.	10	19	10
Southern 5 per cent. pref.	83	105	4
5 per cent. prd.	46	63	7
def.	108	146	8
Transport "C"	32	41	7

The rise in values during the year does not, of course, indicate satisfaction with the terms of the revised financial agreement. Nevertheless, although it is realised that the current revenue of the railways, which are working to capacity, is much above the rental figure of £43,000,000, the railways

are assured of a stabilised income. There has been a much wider recognition of the investment merits of senior preference stocks ; guaranteed stocks and debentures have also been in increased demand, and the latter have been in short supply in the market. L.N.E.R. first guaranteed, which was 75½ at the beginning of the year, has since moved up to 87½, and during the same period this company's second guaranteed has risen from 60 to 76½. L.M.S.R. guaranteed is 97½ at the time of writing, compared with 86 at the beginning of the year. Elsewhere, Great Western 4 per cent. debentures have risen during the year from 105 to 111, and Southern 4 per cent. debentures from 104½ to 108½.

Following last week's sharp declines, most of the junior stocks have attracted attention and have regained a good part of their recent reaction. Exceptionally, L.N.E.R. second preference, which tended to come in for speculative activity on the possibility that a better dividend may be in prospect, was higher on balance for the week at 19½, compared with 18½. It may be recalled that in respect of 1940, the dividend on Great Western ordinary was 4 per cent., that on L.M.S.R. ordinary 1½ per cent.; Southern deferred received 1½ per cent., and L.N.E.R. second preference, 2 per cent. In sympathy with the tendency at the time of writing, Argentine and other foreign railway stocks have been inclined to show some recovery. Canadian Pacific also tended to move better.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

Railways	Miles open 1940-41	Week Ending	Traffic for Week		No. of Weeks	Aggregate Traffics to Date			Shares or Stock	Prices				
			Total this year	Inc. or Dec. compared with 1940		Totals		Increase or Decrease		Highest 1940	Lowest 1940	Dec. 12, 1941		
						This Year	Last Year							
South & Central America														
Antofagasta (Chili) & Bolivia	834	7.12.41	£ 19,550	+ 1,110	49	£ 958,620	£ 844,660	+ 113,960	Ord. Stk.	114	3½	8 Nill		
Argentine North Eastern	753	6.12.41	ps. 172,900	+ ps. 50,300	23	ps. 4,445,500	ps. 3,783,200	+ ps. 662,300	6 p.c. Deb.	3½	1	3 Nill		
Bolivar	174	Nov., 1941	4,690	+ 1,340	48	43,194	42,500	+ 694	Bonds	8	5	7½ Nill		
Brazil	...	...										
Buenos Ayres & Pacific	2,801	29.11.41	ps. 1,380,000	+ ps. 70,000	22	ps. 28,415,000	ps. 24,942,000	+ ps. 3,473,000	Ord. Stk.	44	1	5½ Nill		
Buenos Ayres Great Southern	5,082	29.11.41	ps. 2,708,000	+ ps. 432,000	22	ps. 47,154,000	ps. 42,052,000	+ ps. 5,102,000	Ord. Stk.	104	3	8 Nill		
Buenos Ayres Western	1,930	29.11.41	ps. 935,000	+ ps. 139,000	22	ps. 18,238,000	ps. 14,476,000	+ ps. 3,762,000	"	88	2	5½ Nill		
Central Argentine	3,700	6.12.41	ps. 1,534,300	+ ps. 183,200	23	ps. 41,116,950	ps. 31,922,600	+ ps. 9,194,350	"	84	2	6½ Nill		
Do.	...	...							Dfd.	4	2½	Nill
Cent. Uruguay of M. Video	972	29.11.41	23,055	- 3,736	22	495,123	443,696	+ 51,427	Ord. Stk.	34	4	6 Nill		
Costa Rica	188	Oct., 1941	22,162	+ 6,647	18	91,158	72,735	+ 18,423	Stk.	12	12	16½ Nill		
Dorada	70	Nov., 1941	13,060	+ 1,260	48	136,030	134,200	+ 1,830	I Mt. Db.	99	97½	92½ 6½		
Entre Rios	808	6.12.41	ps. 218,100	+ ps. 45,700	23	ps. 6,445,100	ps. 5,220,800	+ ps. 1,230,300	Ord. Stk.	4	4	6 Nill		
Great Western of Brazil	1,016	6.12.41	16,000	+ 1,200	49	493,900	514,300	- 20,400	Ord. Sh.	4/-	1/-	7½ Nill		
International of C.I. Amer.	794	Oct., 1941	\$409,481	+ \$68,280	43	\$4,666,581	\$4,746,621	- \$80,040	"	—	—	—		
Interoceanic of Mexico	...	...							1st Pref.	9d.	9d.	½ Nill
La Guaira & Caracas	224	Nov., 1941	6,925	+ 1,520	22	72,370	72,500	- 130	—	6	4	—		
Leopoldina	1,918	29.11.41	28,703	+ 2,528	48	1,267,783	1,109,457	+ 156,326	Ord. Stk.	2½	4	3½ Nill		
Mexican	483	30.11.41	ps. 374,900	+ ps. 35,100	22	ps. 6,526,400	ps. 5,838,200	+ ps. 688,200	"	2/1½	4	3½ Nill		
Midland of Uruguay	319	Oct., 1941	13,089	+ 645	17	54,363	46,005	+ 8,358	—	—	—	—		
Nitrate	386	30.11.41	4,107	+ 1,202	47	132,903	160,208	- 27,305	Ord. Sh.	2½	1	3½ 3½ Nill		
Paraguay Central	274	6.12.41	\$5,091,000	+ \$511,000	23	\$81,257,000	\$78,772,000	+ \$2,485,000	Pr. Lt. Stk.	41	36	42½ 7½ Nill		
Peruvian Corporation	1,059	Nov., 1941	63,497	+ 353	22	355,843	328,469	+ 27,374	Pref.	4	1	5 Nill		
Salvador	100	Oct., 1941	c. 35,000	+ c. 4,000	18	c. 191,172	c. 165,683	+ c. 25,489	—	—	—	—		
San Paulo	1534	30.11.41	38,125	+ 1,073	48	1,764,625	1,742,068	+ 22,557	Ord. Stk.	50	23	45 4½ Nill		
Taital	160	Oct., 1941	5,600	+ 3,005	17	21,990	19,320	+ 12,670	Ord. Sh.	15/1½	8	1 Nill		
United of Havana	1,346	6.12.41	21,268	+ 8,614	23	436,691	342,292	+ 94,399	Ord. Stk.	8	4	2 Nill		
Uruguay Northern	73	Oct., 1941	1,505	+ 167	17	5,434	4,275	+ 1,159	—	—	—	—		
Canada	23,560	7.12.41	1,223,084	+ 205,719	49	56,496,182	45,775,450	+ 10,720,732	Perp. Dbs.	86	68	93½ 4½ Nill		
Canadian Northern	—	—	—	—	—	—	—	—	4 p.c. Gr.	105½	95½	99½ 4 Nill		
Grand Trunk	—	—	—	—	—	—	—	—	Ord. Stk.	9½	4½	10½ Nill		
Canadian Pacific	17,137	7.12.41	932,600	+ 201,000	49	40,981,000	31,657,400	+ 9,323,600	—	—	—	—		
India	Assam Bengal	1,329	—	—	—	—	—	—	Ord. Stk.	99½	71	100 3		
Baris Light	202	30.9.41	3,097	- 368	26	86,985	74,625	+ 12,360	—	—	—	—		
Bengal & North Western	2,099	Oct., 1941	245,100	+ 634	4	245,734	245,124	- 634	Ord. Stk.	283	234	243 4½ Nill		
Bengal-Nagpur	3,269	20.9.41	273,975	+ 35,250	24	4,430,124	4,025,551	+ 404,573	—	96	83½	99½ 4 Nill		
Bombay, Baroda & Cl. India	2,986	30.11.41	331,350	+ 19,500	34	7,046,775	6,512,400	+ 534,375	—	108	99	105½ 5½ Nill		
Madras & Southern Mahratta	2,939	20.9.41	195,675	+ 28,103	24	3,473,961	2,858,672	+ 615,289	—	104	97½	101½ 7½ Nill		
Rohilkund & Kumaon	546	Oct., 1941	48,150	+ 1,105	4	48,150	47,045	+ 1,105	—	284	238	343 4½ Nill		
South Indian	2,421	20.9.41	149,554	+ 10,689	24	2,514,089	2,163,597	+ 350,492	—	93½	83	97½ 4½ Nill		
Beira	204	Sept., 1941	72,429	—	52	878,223	74,625	+ 12,360	—	—	—	—		
Egyptian Delta	610	31.7.41	7,912	+ 2,864	18	82,025	56,624	+ 25,401	Prf. Sh.	7/10½	4	2 Nill		
Manila	—	—	—	—	—	—	—	—	B. Deb.	53	44½	64 5½ Nill		
Midland of W. Australia	277	May, 1941	17,591	+ 3,683	48	167,924	145,304	+ 22,620	Inc. Deb.	88	80	89½ 6½ Nill		
Nigerian	1,900	27.9.41	43,874	+ 12,122	26	1,289,214	923,862	+ 365,352	—	—	—	—		
Rhodesia	2,442	Sept., 1941	491,604	—	25	5,643,649	—	—	—	—	—	—		
South Africa	13,291	25.10.41	777,083	+ 59,570	30	22,576,958	20,254,972	+ 2,321,986	—	—	—	—		
Victoria	4,774	July, 1941	955,039	+ 86,611	4	955,039	868,428	+ 86,611	—	—	—	—		

Note. Yields are based on the approximate current prices and are within a fraction of 1/2. Argentine traffics are given in pesos

† Receipts are calculated @ Is. 6d. to the rupee

§ ex dividend

